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COSTS AND MARGINS AND OTHER RELATED  
FACTORS IN THE DISTRIBUTION OF FLUID  
MILK IN FOUR ILLINOIS MARKET AREAS

By C. A. BROWN



URBANA, ILLINOIS, DECEMBER, 1928

#### ACKNOWLEDGMENT

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# COSTS AND MARGINS AND OTHER RELATED FACTORS IN THE DISTRIBUTION OF FLUID MILK IN FOUR ILLINOIS MARKET AREAS

BY C. A. BROWN, Associate in Dairy Economy

A permanent and healthy growth of dairying depends in great part upon the proper application of economic principles within the industry, cooperation among its various divisions, and an intelligent understanding of its policies by the public. Undoubtedly, controversies that have occurred in the past have occasionally caused consumers, to be skeptical regarding milk quality, and the cry of "profiteer" has at times resulted in a partial boycott of milk. The vast number of improvements in quality and service, which necessarily have raised costs, appear to have been generally overlooked by the consuming public.

In the period previous to the past few decades the marketing of fluid milk was a very simple process. Producers delivered their own product in the raw state, dipped it from cans, and poured it into receptacles provided by consumers. Centers of production were close to markets. Restrictions relating to quality of product, whenever imposed, were very lenient. Raw milk was generally preferred. Wholesale milk prices were low and consumers received milk at prices ranging from about five to eight cents a quart. There were but two principal parties—producer and consumer—to any controversy that may have arisen.

The rapid growth of cities produced a corresponding enlargement of fluid-milk markets. An increasing rate of consumption, along with the increase in population, further increased the demand for milk. The zones of production gradually enlarged, their limits extending farther and farther away from the cities. In the case of the larger cities production centers were extended so far from markets that country receiving stations became essential to efficient marketing.

The public standard of milk quality has gradually become higher, generally resulting in regulatory measures requiring milk pasteurization and sanitary production and distribution. In most localities it has become impossible for the individual producer to market his own product. Production has become specialized; marketing commercialized. Intervening agencies have gradually supplanted individual producers as marketing agents, and problems in the industry therefore involve now not only producers and consumers, but also a number of intermediary parties.



Specialization and increasing complexity among the various branches of the dairy industry have made it rather difficult for any one branch to become familiar with the operation of the others, or for the public to have an adequate knowledge of the industry as a whole. Under these conditions harmony and unity of action, which are essential to efficient marketing and to the general welfare of any industry, have not been so prevalent as they might have been.

While the principal object in the present study was to obtain data concerning dealers' costs and margins in the four large markets<sup>1</sup> for which Illinois farmers and dairymen produce milk, discussion of other important factors in the field of distribution is placed first in order that the reader may have a better background for the consideration of the material on costs and margins.

This survey is not presented as a highly detailed study, for it would have been impossible to cover so large a field within the allotted time. It is believed, however, that the facts here presented display a fairly definite and representative picture of the general field of fluid-milk distribution in the four principal markets supplied by Illinois producers, and will open the way for further detailed analyses.

## SOURCE OF DATA

The actual gathering of the information contained herein began about April, 1926. In addition to a general summary of facts concerning the dairy industry in the state as a whole, detailed information was obtained for four leading markets, Chicago, St. Louis, Peoria, and Quincy.

The work was greatly facilitated by the cooperation of milk distributors and jobbers, municipal health departments, chambers of commerce, government bureaus, transportation companies, producers and dealers associations, and other agencies indirectly interested in the marketing of fluid milk.

The records of the larger milk dealers located in the centers of consumption were the source of the material on costs and margins. In practically every case, several weeks were spent at each dealer's place of business making detailed examination of all records pertaining to marketing. Production, transportation, processing, sales, and cost records were among those that were scrutinized. Examination of cost records corresponded in a general way to balance sheet audits. No attempt was made by the investigator to check the valuations of the tangible and intangible property, the values on the balance sheets being accepted as there shown.

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<sup>1</sup> In a "market" is included the area served by distributors whose main offices are located in the city. Thus the suburbs of a city are included as well as the city proper.



## MILK PRODUCTION

The gradual shifting of the center of population to the West has contributed materially to the advancement of dairying in Illinois. The rapid growth of cities within and near the borders of the state has developed favorable markets. In fact the general distribution of cities over the state has made it possible for dairying to become an important enterprise in practically every county.

The nearness of production areas to consumption centers in Illinois tends to lower certain distribution costs, principally transportation, and thereby makes it possible for the producer to receive a larger part of the consumer's dollar. With the state's relatively large urban population, a large portion of the production is sold at the more remunerative prices of fluid-milk markets.

### Production in the State as a Whole

Dairy cows have been decreasing in numbers since January 1, 1925. Estimates made at the beginning of the years 1926, 1927, and 1928 were, respectively, 1.0, 5.8, and 7.7 percent below the 1925 estimated figures. On January 1, 1928, there were 968,000 milk cows in the state. The distribution of these is shown in Fig. 1. The decline in numbers may be attributed to various causes, among them the urgent need of cash by farmers, resulting in a relative increase in the sale of veal calves, tuberculin test regulations, increased competition with Wisconsin dairy sections, and lastly, competition of dairying with other types of farming.

Altho there are no recent Census figures with which to measure the exact increase in production per animal, it is estimated that the recent increase has more than counterbalanced the decrease in the number of animals, as it did in the five-year period 1919 to 1924, when the state increased its production of milk 17.45 percent. Increases in the northern and central sections during this period were appreciably above the state average (Fig. 2). The growing demand of the Chicago market for fluid milk stimulated production in these northern counties. Increases in the central section may be attributed to an extension of the Chicago market into a few counties of this area, to the growing demand of cities within the area, and to a trend toward more diversified farming. The southern section has not had the same rate of growth in production as the other two sections of the state, altho several southern counties, because of good transportation facilities to the St. Louis market, are exceptions to this general statement.

The production of milk in Illinois counties and those adjacent in bordering states is shown in Fig. 3. The counties in the northeastern section of the state, which supply the Chicago market, produce much more milk than those in the other two sections of the state. McHenry



FIG. 1.—NUMBER OF MILK COWS IN ILLINOIS COUNTIES ON JANUARY 1, 1928  
(Each dot represents 1,000 cows two years old or older)

The greatest concentration of milk cows occurs in the northeastern part of the state, which supplies the Chicago fluid-milk market, and in the northwestern part, which produces milk chiefly for cheese manufacture. (Data from Illinois Crop and Livestock Statistics.)

truck farming, nor is it long enough to insure a mature corn crop every year. Silage, however, which is an excellent feed for dairy cows, can be produced during the shorter growing period. Legumes, such as clover, alfalfa, and certain other valuable dairy feeds, are well adapted to the soil and climate. Competition from Wisconsin milk producers on the Chicago fluid market has been materially increased by the adoption of improved methods of transportation. Hence any movement in the Illinois part of the Chicago dairy district having as its

county produced 50,000 gallons of milk to the square mile and a total of about 31 million gallons for the year 1924. Production in the central and southern sections is rather uniformly distributed, with the exception of the counties which supply the St. Louis market; these produce about 80 percent of the milk dispensed in this market.

Altho there were fewer milk cows in Illinois in 1926 than in 1925, the total 1926 production was approximately 3 percent larger, being nearly 528 million gallons.<sup>1</sup> While this is a large amount, still it represents a production per square mile that is small compared with that of Wisconsin and eastern Iowa. It seems logical to expect that Illinois dairymen will always encounter very intense competition from these two states, especially from Wisconsin, in which dairying apparently is the most remunerative type of farming. Climatic conditions in Wisconsin generally are not so favorable for other profitable types of agriculture. The growing season, for example, does not begin soon enough to encourage intensive

<sup>1</sup> Circular 360, Illinois Crop and Livestock Statistics, issued by the U. S. Department of Agriculture cooperating with the Illinois Department of Agriculture.

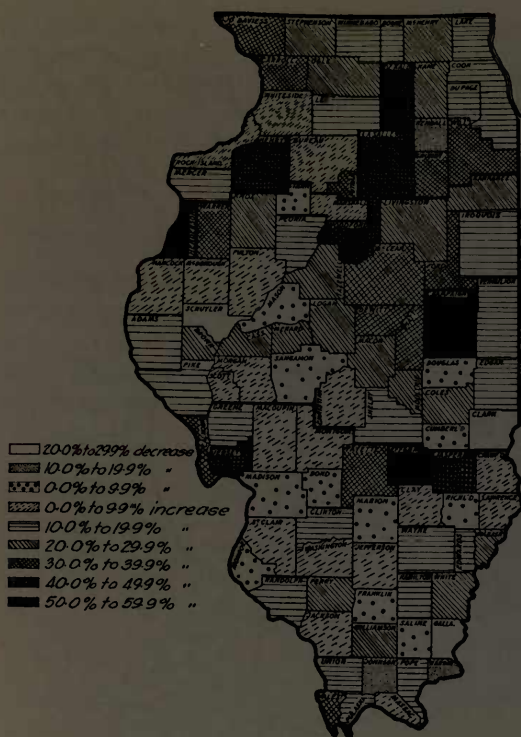


FIG. 2.—CHANGES IN AMOUNT OF MILK PRODUCED IN COUNTIES OF ILLINOIS DURING THE FIVE-YEAR PERIOD 1919-1924

Production generally increased thruout the state during this five-year period, the average increase for the state as a whole being 17.45 percent. Decreases were confined largely to the southern counties. The production of only three counties declined more than 20 percent. (Based on U. S. Census of Agriculture, 1920 and 1925.)

of ice cream. These major products by no means constitute the total manufactured output, for considerable quantities of milk powder, casein, malted milk, and soft cheese also are manufactured.

The climate of Illinois is well adapted to the dairy industry, and to the production of certain legumes, corn, and other important dairy feeds. The demand of several of the large markets supplied from this state is steadily increasing. Dealers and producers are more generally organized in their respective groups, and there is considerably more understanding and cooperation than formerly between both groups of organizations, tending toward arbitration and the betterment of conditions in the industry. These conditions seem favorable to the expansion

object the expansion of dairying, would have to reckon with intense competition from the north.

Because of the large urban population of Illinois, a large portion of the milk produced is used for fluid consumption. Cream to be used in butter manufacture is produced mainly by farmers outside of the fluid-milk sections. There is a large number of condensaries in the state, and cheese factories utilize much of the milk produced in the northwestern part. A large annual output of ice cream is needed to supply the demand in the cities. In 1924 the state produced 58 million pounds of creamery butter, 94 million pounds of condensed and evaporated milk, and 13 million gallons





of the industry in Illinois, tho if farmers were to increase milk production too rapidly, such a supply of fluid milk could be created that relatively lower prices would be necessary to absorb it. The large amount of labor necessary in milk production is, however, a factor which tends to curb rapid expansion.

### Production in Chicago District

The fluid-milk markets available to Illinois producers consume the output of many thousands of dairies. The Chicago market alone now uses the production of approximately 35,000 dairy farms. This milk, however, is not all purchased from Illinois producers. It comes from seven states; namely, Wisconsin, Indiana, Michigan, Minnesota, Iowa, and Ohio, tho Illinois and Wisconsin supply more than 80 percent of the total.

Regardless of the advantage which certain Illinois counties enjoy because of nearness to the Chicago market, and their ability to supply the entire demand of Chicago consumers it is very doubtful, with the large amount of competition from Wisconsin, whether the state will ever supply more than 50 percent of the total consumption of this market. At the present time it supplies about 40 percent. A slight increase, however, probably will occur, as it is expected that the majority of those dairymen who lost their market when the tuberculin test regulations went into effect will eventually regain it. Since the state is in the heart of the corn belt, where dairying is somewhat a matter of choice, it is probable that higher fluid-milk prices or lower corn and hog prices would encourage the production of fluid milk.

The result of a survey of 3,620 dairy farms located in northeastern Illinois and southern Wisconsin, which supply the Chicago fluid-milk market, is shown in Table 1. The Illinois farms, 48 percent of which were operated by tenants, averaged ten acres more per farm than those in Wisconsin. As would be expected on the high-priced Illinois land near Chicago, the percentage of acres in pastures was smaller than in areas more distant from the city. Furthermore, in dairy sections more intensive dairying would generally be expected on the higher priced land, a fact which is substantiated by the data showing that there is one head of cattle for each 5.5 acres in Illinois, in comparison with 6.1 acres in Wisconsin farms. There were more heifers, however, per acre on the Wisconsin farms. Practically all the dairies fed silage, tho the percentage following this practice was somewhat greater in Wisconsin than in Illinois.

### Production in St. Louis District

Approximately 80 percent of the fluid milk consumed in St. Louis is produced in Illinois and 20 percent in Missouri. About one percent

TABLE 1.—SOME FACTS CONCERNING NORTHERN ILLINOIS AND SOUTHERN WISCONSIN DAIRY FARMS IN CHICAGO DAIRY DISTRICT, 1925

	Illinois	Wisconsin
Total number of dairy farms surveyed.....	2 699	921
Average size of farms, acres.....	139	129
Percentage of landowners operating farms.....	52	61
Percentage of tenants operating farms.....	48	39
Ratio of pasture acres to total acres.....	1:4.1	1:3.8
Total cattle per dairy, average.....	25	21
Milk cows per dairy, average.....	19	15
Heifers over 1 year old, per dairy, average.....	3	3
Heifers under 1 year old, per dairy, average.....	3	3
Ratio of purebred sires to total cattle.....	1:71	1:44
Daily sales per dairy, average, in pounds.....	325	232
Percentage of dairies operating milking machines.....	18	18
Percentage of dairies using silos.....	85	95

of the Missouri production is produced in the dairies of the city. Shipments of sweet cream, however, are made occasionally from the state of Indiana. In 1917, according to the data contained in an unpublished government survey, 74 percent of the market supply came from Illinois and 26 percent from Missouri. The dairies located within the city itself supplied 20 percent of this latter amount, all of which was consumed in the raw state. The increasing demand for pasteurized milk, however, has gradually reduced the sales of raw milk, exclusive of certified milk, to a small percentage of total sales.

Good roads and excellent transportation facilities undoubtedly have been influential in enabling Illinois producers to supply approximately 80 percent of the fluid-milk demand of this market.

### Production in Peoria and Quincy Districts

Fluid-milk production for the Peoria market is confined to three counties. Of the total market requirements, Peoria county supplies approximately 50 percent; Tazewell county, 33 percent; and Woodford county, 17 percent. With the Peoria market situated near the center of this production area, transportation presents relatively fewer difficulties than it does in the Chicago and St. Louis markets, which are located at one edge of the production districts. The maximum haul in the Peoria district is only 50 miles.

Even the Quincy is located just across the river from Missouri, approximately 90 percent of its fluid-milk consumption is produced in Illinois. Here again, improved surface roads have been instrumental

in enabling Illinois producers to secure practically all the trade of a border market.

### Factors Influencing Rate of Production

The quantity of milk produced responds more quickly to increases in profits than does the supply of some of the other livestock products. The volume of milk production available for fluid-milk sales may be increased to a considerable degree by changes in methods of feeding the cows, by reducing the amount of milk fed to calves, as well as by increasing the number of producing animals. Variations in the total amount of milk produced that result from increases or decreases in the number of dairy cattle are much slower than those due to other factors mentioned, and occur gradually in response to protracted periods of relatively high and low prices.

Annual variation in milk sales per farm may be regarded as an approximate measure of the effect of various economic influences upon dairying. The rate of production in the Chicago district declined considerably during the four-year period beginning with 1917 (Table 2). The average yearly production for this period was about 11 percent below the fifteen-year average (1912 to 1926) notwithstanding the fact that during the same four-year interval producer milk prices were slightly more than 30 percent higher. During the war period, the prices of dairy products increased relatively less than the prices of

TABLE 2.—YEARLY VARIATION IN AVERAGE MILK SALES PER FARM IN CHICAGO DISTRICT DURING THE FIFTEEN YEARS, 1912 TO 1926<sup>1</sup>

(Based on receipts at a group of plants that obtained milk for fluid distribution in the Chicago market)

Year	Number of farms	Average annual sales per farm	
		Pounds	Percentage of 15-year Average
1912.....	1 445	81 233	92.5
1913.....	1 584	86 636	98.6
1914.....	1 827	90 696	103.3
1915.....	2 013	91 444	104.1
1916.....	2 084	90 260	102.8
1917.....	2 019	80 411	91.6
1918.....	2 063	71 418	81.3
1919.....	2 265	83 216	94.8
1920.....	3 084	77 951	88.8
1921.....	3 344	87 179	99.3
1922.....	3 502	88 705	101.0
1923.....	3 665	91 934	104.7
1924.....	3 855	98 533	112.2
1925.....	3 855	105 109	119.7
1926.....	2 961	92 463	105.3
Average.....		87 812.53	100.0

<sup>1</sup>Farms are located in Illinois and Wisconsin.



other commodities. The average farm wage during this period was above the prewar level. Not only wages, but high feed prices, greatly increased the cost of producing milk. Other types of farming, involving less labor than dairying, were yielding very remunerative returns, and consequently relatively more time was devoted to the production of other commodities at the expense of milk production. High grain prices tended to encourage direct marketing of grain in preference to indirect marketing thru livestock. At the outbreak of the war favorable veal and beef prices encouraged farmers to sell more old cows and calves than usual, and consequently there were fewer cows on the farms to produce milk during the 1917-1920 period.

In 1921, when readjustment from war conditions was in progress, and when other types of farming had become relatively less profitable than dairying, farmers began gradually to devote more time to milk production. The abnormal demand for manufactured milk products created by the war had abruptly stopped, and producers in fluid-milk districts were soon able to add good cows to their herds at greatly reduced prices. Not only did increased numbers of producing animals increase the production per farm, but lower feed prices, together with the adoption of better production methods, increased the rate of production per animal. Thus the 1921 farm milk sales in the Chicago district were approximately 12 percent greater than in 1920. This rate of increase was greatly curtailed the following year by a cut of approximately 10 percent in producer milk prices which followed a 2-cent reduction, from 14 cents to 12 cents, in the retail price of quarts. This price, however, was raised to 13 cents in January, 1923, and to 14 cents in July, and as a result the 1923 yearly average of producer milk prices was raised about 37 percent above that of 1922. Both retail and average producer prices remained practically unchanged during the two years following; the producer prices having the effect of stimulating production to a level much above the average for the entire period. The abrupt decline from the previous year, occurring in 1926, was the result of the eradication of cows which showed a positive reaction to the tuberculin test.

### Seasonal Variation in Production

That there is considerable variation in milk production among the different months of the year in each district and among districts is shown by Table 3 and Fig. 4.

A large spring surplus occurs in the St. Louis dairy region. The average maximum production for the four-year period 1922-1925 occurred in May and averaged 49 percent above the monthly average. The minimum, which occurred in September, was 38 percent below the monthly average for the period. The difference between the high and

TABLE 3.—SEASONAL VARIATION IN MILK PRODUCTION IN FOUR DAIRY DISTRICTS OF ILLINOIS<sup>1</sup>(Figures are based on total receipts at milk plants and represent percentage of average month during period specified)<sup>2</sup>

Month	Chicago 1925	St. Louis 1922-1925	Peoria 1926-1927	Quincy 1924-1926
January.....	89.6	109.5	79.9	99.4
February.....	86.1	104.8	78.6	95.8
March.....	99.7	117.5	90.6	106.1
April.....	100.6	120.5	95.9	108.9
May.....	119.8	149.0	129.1	123.9
June.....	119.1	112.8	136.5	109.9
July.....	108.4	93.1	125.2	106.5
August.....	99.6	75.6	112.9	99.0
September.....	91.7	62.3	93.3	86.2
October.....	96.0	72.8	88.6	86.1
November.....	90.5	82.4	84.6	85.2
December.....	98.9	99.7	84.8	93.0
Total volume (pounds) on which percent- ages are based.....	647,217,469	117,491,991	69,001,699	15,174,190

<sup>1</sup>Trend removed. <sup>2</sup>Not corrected for varying number of days in different months.

low points was not so great in the Peoria district, but the production was more irregular than that of the Chicago and Quincy districts, neither of which had a variation greater than 40 percent.

Favorable weather and pasture conditions raised the spring and early summer production to a maximum in all four districts. Spring freshening, furthermore, had some buoyant effect on milk flow in certain districts. Production was materially reduced during the late summer and early fall months, when the weather is normally hot and dry, the pastures scanty, and flies plentiful; and a flow near the minimum was generally reached during the period from September to November. During this time of the year pastures usually must be supplemented with other feeds. Thruout this season the milk flow is especially dependent on the general management of the herd, which involves such factors as kind and amount of feed, the number of late fall-freshening cows, and amount of care given the animals.

Differences in production among districts were also largely the result of variations in the practices just mentioned. Since dairying is the major type of farming in the Chicago territory, we should naturally expect efficient dairy methods to be used in this district. One evidence that they are used is that the milk flow is more uniform in this district than in other Illinois production areas.

Greater uniformity in production generally enables producers to utilize labor more efficiently and to take advantage of the relatively higher prices of fluid milk that occur in most markets during the fall

and winter. Gross returns in this period of the year, however, may not be large enough to induce producers to adopt fall freshening and heavy feeding very extensively, for even tho price is the main consideration it is not the only one. Conditions on the farm may not be

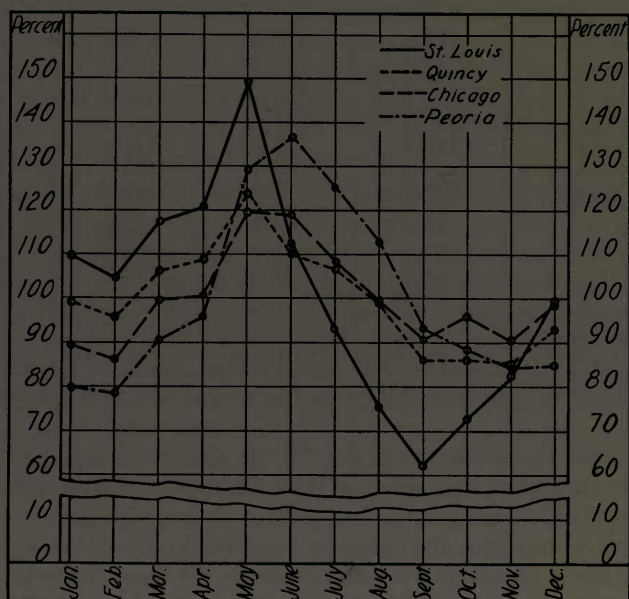


FIG. 4.—SEASONAL VARIATION IN MILK PRODUCTION IN FOUR DISTRICTS IN ILLINOIS

The greatest irregularity in production occurs in the St. Louis and Peoria fluid-milk areas, where production per farm is smallest. The St. Louis district produced almost two and one-half times as much milk in the season of maximum production as it did in the period of minimum production. See Table 3 for time intervals on which the data are based. Average monthly production equals 100.

favorable to making the changes necessary to obtain greater uniformity in production. On farms where dairying is incidental to other types of farming, where there are large areas of pasture, or where feed is scarce, the higher prices are less effective than in intensive fluid-milk districts.

The effect of the World War on the seasonal production of milk in the Chicago dairy district is shown by Fig. 5 and Table 39 of the Appendix. It is evident that the spread between the three months of highest production and the three months of lowest production was greater during the war period than it was either before or afterwards. Thruout this period practically all types of farming were profitable,

—some more so than dairying. Partly on account of high wages and relatively large returns for agricultural products other than milk, there was a greater tendency than usual for dairy farmers to diversify and engage in less intensive types of farming in connection with dairy-

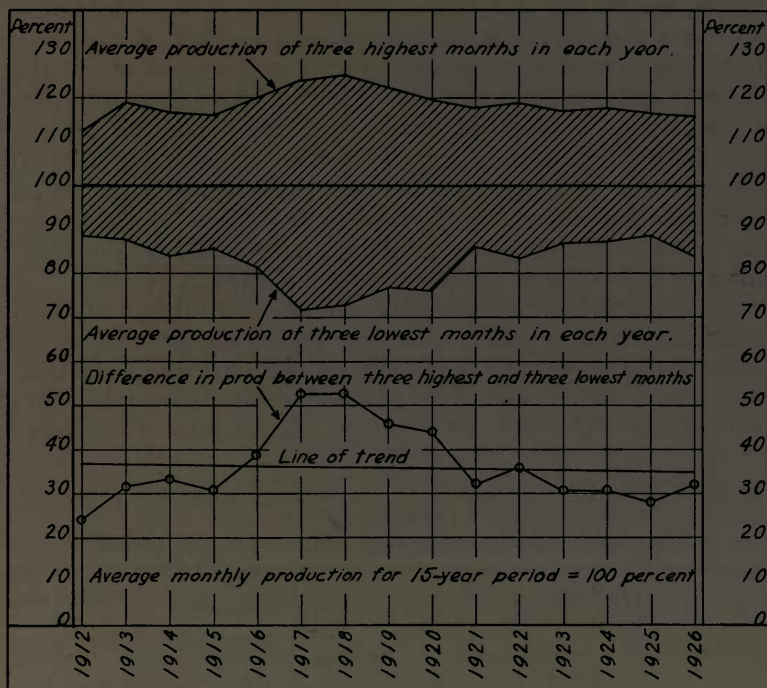


FIG. 5.—SPREAD BETWEEN MAXIMUM AND MINIMUM PRODUCTION IN THE CHICAGO DAIRY DISTRICT EACH YEAR FROM 1912 TO 1926

The average monthly production for the fifteen years is indicated as 100. The area above and below this line shows the extent to which the average production of the three high months of each year and the three low months deviated from the fifteen-year average. The World War added greatly to the irregularity of production between seasons.

The lower graph is another expression of the facts shown by the upper graph. Here a single curve is used to show the difference between the three high months of each year and the three low months. Trend removed. (See Table 39, Appendix.)

ing, usually at the expense of milk production. Furthermore, feeds were relatively high in comparison to returns for milk, so farmers were prone to feed less heavily. Consequently in the months of April, May, and June, when the rate of milk flow is normally less dependent upon care of the herd and feeds to supplement pastures, the proportion of the year's production was greater than during corresponding

months in years preceding or following the war. With few exceptions the three highest months for the fifteen years were April, May, and June, and the three months of lowest production occurred between August and November.

Following the close of the war, when grain and feed prices started to recede, heavier fall and winter rations began to have their effect in producing a more uniform flow of milk, and by 1921 normal relationship was again established between winter and summer production.

Greater uniformity in the flow of milk thruout the year undoubtedly would make relatively higher producer prices possible, for returns from surplus products are generally lower than from fluid milk. Altho prices are generally higher in Illinois districts during the season of least production, failure of production to respond to the larger returns seems to indicate that producers as a whole believe that the returns are not yet sufficient to warrant a change in practice.

Generally speaking, considerable attention is paid to uniformity of production in intensive dairy districts. In the Chicago section, where dairying is the major type of farming on many farms, production per farm is larger than in any of the three other districts studied and also more uniform (Table 4). As a rule, in the central and southern sec-

TABLE 4.—DAILY MILK PRODUCTION PER DAIRY FARM IN FOUR DISTRICTS OF ILLINOIS

(Figures are based on daily milk receipts at dealers' plants)

Month	Chicago: average for 1925-1926		St. Louis <sup>1</sup> : average for 1922-1925		Peoria: 1927		Quincy: average for 1924-1926	
	Pounds	Percentage of average month	Pounds	Percentage of average month	Pounds	Percentage of average month	Pounds	Percentage of average month
January.....	277	95.8	120	107.0	71	77.4	157	95.3
February.....	286	98.9	128	114.1	78	85.0	167	101.4
March.....	287	99.2	129	115.0	83	90.5	172	104.4
April.....	284	98.2	137	122.2	96	104.6	184	111.7
May.....	330	114.1	164	146.2	115	125.3	205	124.4
June.....	347	120.0	128	114.1	125	136.2	188	114.1
July.....	303	104.7	102	90.9	112	122.1	174	105.6
August.....	278	96.1	83	74.0	103	112.3	164	99.5
September.....	266	92.0	71	63.3	84	91.6	141	85.6
October.....	265	91.6	80	71.3	79	86.1	134	81.3
November.....	265	91.6	94	83.8	78	85.0	139	84.4
December.....	283	97.8	110	98.1	77	83.9	152	92.3
Average month...	289.25	100.0	112.17	100.0	91.75	100.0	164.75	100.0
Total volume (pounds) on which figures are based	949,868,753		117,491,991		35,003,017		15,174,190	

<sup>1</sup>The figures representing St. Louis production are based upon the inner district only. The rate of production in the outlying districts is lower.



tions of Illinois, dairying is carried on as a supplementary type of farming. Fewer cows are kept on farms, heavy winter feeding is not so extensively practiced, and production per animal is less than in the northern part of the state. Such conditions are not generally conducive to a uniform flow of milk thruout the year.

### Seasonal Variation in Butterfat Content

The monthly variations in butterfat tests among the Chicago, St. Louis, Peoria, and Quincy districts can readily be followed by referring to Table 5 and Fig. 6. While it is beyond the scope of this study to ascertain the effect of all factors which influence milk tests, still a part or all of the following conditions undoubtedly partly account for the variations shown in this graph.

The low tests thruout the late spring and early summer months shown in all four districts are due to the heavy feeding of grass during this period and the high milk flow. The increase in test immediately following this period coincides with a low milk flow resulting partly from short pastures. Increases thru the remainder of the year result from a variety of conditions. In the fall, many dairymen begin to supplement pastures with other feeds. As winter approaches they continue to feed more heavily, and consequently in December the cows are on full feed. The effect of the fall freshening of cows is not to be overlooked, since it temporarily increases the butterfat content.

TABLE 5.—SEASONAL VARIATION IN AVERAGE BUTTERFAT CONTENT OF MILK PRODUCED IN FOUR DAIRY DISTRICTS IN ILLINOIS

(Figures represent percentage of butterfat in milk as received at dealers' plants)

Month	Chicago 1926	St. Louis <sup>1</sup> 1927	Peoria 1927	Quincy 1925
January.....	3.53	3.8	3.67	3.92
February.....	3.48	3.7	3.56	3.83
March.....	3.50	3.7	3.49	3.69
April.....	3.55	3.6	3.55	3.61
May.....	3.50	3.5	3.45	3.67
June.....	3.44	3.5	3.49	3.65
July.....	3.43	3.5	3.54	3.67
August.....	3.48	3.8	3.66	3.67
September.....	3.53	4.1	3.75	3.71
October.....	3.64	3.9	3.86	3.88
November.....	3.67	4.0	3.92	4.05
December.....	3.68	3.9	3.93	4.06
Approximate average monthly receipts (pounds) on which tests were based.....	32,778,577	18,000,000	2,695,683	423,500

<sup>1</sup>The butterfat content of milk varies greatly in different sections of the St. Louis district, owing to differences in breed. The higher fat-producing breeds predominate in the outlying districts.

Another fact that must be taken into consideration is that these tests are based on receipts at dealers' plants, and hence some of the variation in butterfat test in the Chicago and St. Louis markets may have been the result of different producing areas being drawn upon in different seasons of the year.

The tests of each particular district, it is to be noted, follow about the same general trend thru the year.

*Measuring Gross Returns on Basis of Butterfat Content.*—Gross returns for milk per unit of butterfat depend largely upon the butterfat content of the milk. Producers are generally inclined to consider relative returns for milk on a butterfat basis when making comparisons among butterfat, fluid-milk, cheese, and other market outlets. The demand of the market is a very important factor in determining the butterfat standard that a dairy district should endeavor to approach in order to harmonize most advantageously with economical production. In districts in which the butterfat standard of the producer payment plan is 3.5 percent, we find the majority of the dairies producing milk with a butterfat content ranging around that particular standard.

The 3.5-percent butterfat standard upon which milk prices are generally based, and the usual price differential for milk testing above or below 3.5 percent ordinarily have reacted as a price penalty against the production of milk testing higher than the standard. By way of illustration, let us assume that the base fluid-milk price is \$2.50 per 100 pounds, with a 5-cent differential for each point above or below a 3.5-percent standard. One hundred pounds of 3-percent milk would return the producer \$2.25, a rate of 75 cents for each pound of butterfat contained therein; 100 pounds of 4-percent milk would return \$2.75, a rate of 68.75 cents per pound of butterfat; while 5-percent milk would return only 65 cents per pound of butterfat. Briefly, as the butterfat test rises above the standard, the average return per pound of butterfat declines. Rates per pound of butterfat, when based on other milk prices, are also shown in Fig. 7.

Dairymen may feel that it makes little difference if the rate per pound of butterfat for high-testing milk is less than that for butterfat in milk with a low test, since the actual returns for 100 pounds of 4-percent milk are larger than the amount received for an equal volume of 3-percent milk. It is necessary, however, to take into consideration the significance of the fact that milk flow, as a rule, varies inversely with butterfat content. That is, the average milk flow of low-testing cows, as a whole, is greater than that of high-testing cows. This fact is well known among dairymen and needs no further elucidation.



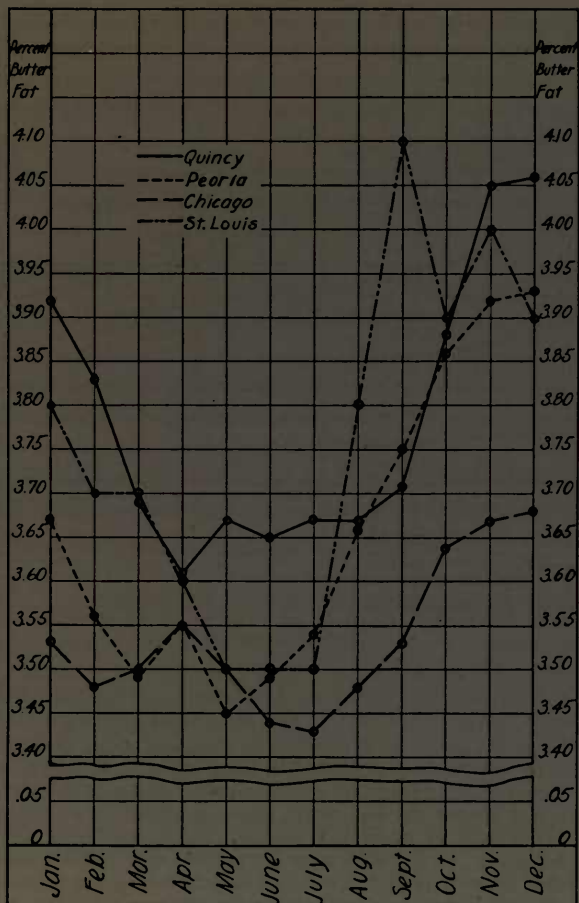


FIG. 6.—SEASONAL VARIATION IN BUTTERFAT CONTENT OF MILK IN FOUR ILLINOIS DISTRICTS

The butterfat content is lowest during the surplus season, when production is highest. The maximum variation occurred in the St. Louis district, where the butterfat test varied from 3.5 percent to 4.1 percent. The graph is based on data from dealers' testing records for one year in each dairy district: Quincy and Chicago, 1925; Peoria, 1927; and St. Louis, 1927. See Table 5.

Since the producer with a high-testing herd will have a lower volume of production per cow than the producer with a low-testing herd, the rated price per pound of butterfat becomes of great importance to him. On the basis of gross returns, the prices commonly

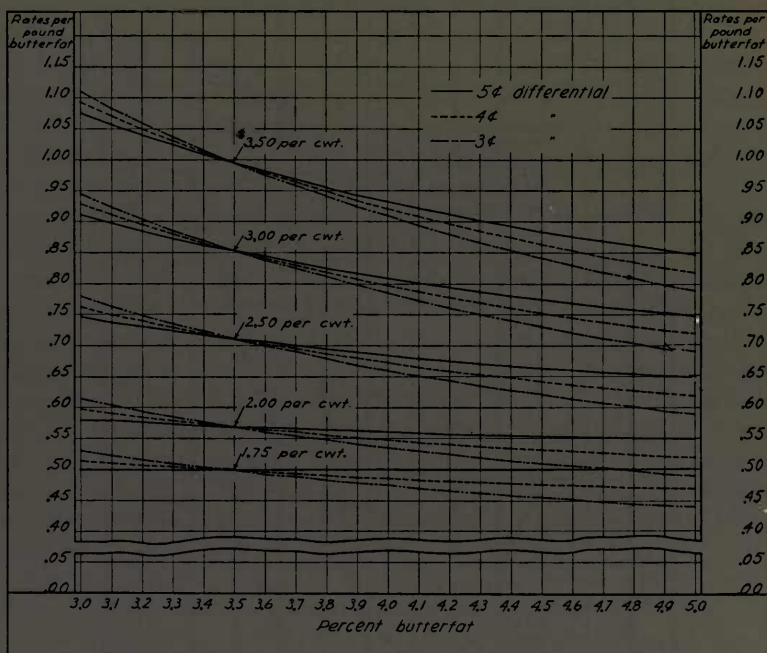


FIG. 7.—RATINGS FOR BUTTERFAT IN MILK SOLD AT VARIOUS FLUID-MILK PRICES WITH THREE, FOUR, AND FIVE-CENT DIFFERENTIALS

From the above graph it is possible to ascertain gross ratings per unit of butterfat in 100 pounds of fluid milk when the milk is sold at the above prices. Prices are based on a 3.5-percent butterfat standard, with differentials of 3, 4, and 5 cents for each point above or below the standard. When 3.5-percent milk sells at \$2.50 per hundredweight, the butterfat rating is 71.4 cents a pound. If the milk tests 3.8 percent fat, and a differential of 5 cents a point is being paid, the rating would be 69.7 cents a pound for the butterfat. The graph is applicable only from a practical standpoint, for above or below certain prices the curves reverse upon the application of particular differentials.

paid for fluid milk based on the 3.5-percent standard with the usual differential tend to inflict a penalty on milk with a high butterfat content. Net returns for milk, however, depend not only upon gross returns per hundred pounds of milk but also upon production costs as well; but if production costs of high-test and low-test milk are practically the same, it is obvious that net returns will be proportionate to gross returns.<sup>1</sup>

Some dealers have created a consumer demand at premium prices for milk high in fat, and consequently pay prices that encourage its

<sup>1</sup>For information pertaining to feed costs of production based on butterfat content of milk, refer to Circular 318 of this Station, by W. L. Gaines.

production. The demand for high-testing milk, altho yet relatively small, is increasing in a majority of the large markets, and many far-sighted breeders, recognizing this fact, are endeavoring to raise the butterfat standard of their herd by selection and breeding. The lower fat producing types of dairy cattle still prevail in most fluid-milk, cheese, and condensary districts of Illinois, while the higher fat yielding types predominate in cream-producing sections.

## MARKETING AGENCIES AND CONTRIBUTORY ORGANIZATIONS

The more important agencies that engage either directly or indirectly in the process of marketing are producer milk-bargaining associations; distributing agencies, consisting of dealers, jobbers, and brokers; and auxiliary organizations such as transportation agencies and bottle exchanges. In addition to these there is the health department which specifies the conditions under which milk for fluid consumption shall be produced and marketed.

### Milk-Bargaining Associations

Producer milk-bargaining associations are organized for the purpose of obtaining greater economic advantages for their members. The success of these organizations depends mainly upon the type of leadership, the cooperation of the individual members, and the amount of service rendered. Under the guidance of capable leadership, they are generally considered a desirable adjunct to marketing. There are several of these organizations operating in various parts of the state, some achieving greater success than others.

A good example of this type of organization in the state is the Illinois Milk Producers' Association at Peoria. This association began operations in October, 1926, with about one thousand members, under the management of the Dairy Marketing Division of the Illinois Agricultural Association. At present there are about 1,100 members, who produce about 90 percent of the total production of the Peoria fluid-milk district. The cooperation given the association by producers and dealers has enabled it to render a very valuable service to milk marketing in that particular section.

The milk marketing plan used by the Association was devised after an inspection and study of various plans used in other cities. In accordance with its provisions, milk is classified on the basis of the purpose for which it is to be used, and producer milk prices are based upon the market value of the different milk classes. There are three classifications. Class 1 includes all milk sold in bottles, both wholesale and retail; all milk sold in bulk; and milk from which wholesale and retail

bottle cream is derived. Milk disposed of in bulk as fluid sweet cream and that used in the manufacture of condensed whole milk and soft cheese containing butterfat is included in Class 2. Class 3 includes the milk used in manufacturing butter and that from which frozen cream for storage is derived.

The net price paid producers, ordinarily called the pool price, is based on the average returns for milk of all classifications. Because of the lower prices paid for surplus milk than for other milk under this scheme, the pool price becomes relatively lower as surplus milk increases and correspondingly higher as it decreases. The prices paid for surplus milk are based chiefly upon the general level of manufacturing markets, and hence milk dealers, by manufacturing dairy products from surplus milk, are enabled to compete with establishments making the manufacture of dairy products their main business. Dealers are thereby encouraged to manufacture dairy products more extensively, and in so doing the local market for milk is expanded. See Table 40 of the Appendix for prices paid in the Peoria district based on the different classifications.

The following constitute some of the more important obligations of the producer to the Association:

1. To deliver all milk produced in such form as agreed upon by the Association to the plant or other destination designated by the Association, with the exception of that used for home and farm consumption.
2. To establish the Association as sole agent for handling, manufacturing, and marketing of all milk delivered.
3. To authorize the Association to receive, grade, pool, standardize, manufacture, or sell all or a part of the milk.
4. To grant a commission of 5 cents per hundred pounds for milk sold by the Association.
5. To produce and keep milk under sanitary conditions until delivered.
6. To permit inspection of the dairy and to correct conditions regarded as being undesirable by the Association.
7. To submit all serious controversies as to grade, weight, and test of milk to the Association for adjudication and settlement.
8. To instruct the Association to collect for his account any money which any person, firm, or corporation may owe for milk delivered by the producer.
9. To sell milk in compliance with price classifications and prices arranged between Association and buyers.

### Milk Distributing Agencies

Dealers, jobbers, and brokers who serve as connecting links between producer and consumer are generally known as middlemen. As milk marketing has become complicated, these intermediary groups have gradually supplanted individual milk producers as marketing agents.

*Service of Dealers.*—From the standpoint of scope of operation, retail dealers are undoubtedly the most important of the three groups.

Their service usually begins upon receipt of milk in the raw state and ends with its delivery to the ultimate consumer or local retailer.

A dealer may supply either the wholesale or retail trade or both. The wholesale trade consists of hotels, restaurants, schools, grocery and delicatessen stores, and other similar establishments that purchase milk in large quantities. Retail distribution necessitates house to house delivery, generally by horse and wagon. In addition to distributing milk, dealers have sponsored and financed the major portion of the advertising of the past. Furthermore, they may manufacture as well as distribute, depending upon the amount and disposition of surplus milk that they handle. During the season of heavy production a large quantity of surplus milk is manufactured into condensed products by certain distributors, and in some localities distributors make the major portion of the ice cream.

*Place of Jobbers in Milk Trade.*—The jobber purchases milk or cream either from producers or wholesale dealers and dispenses it to other dealers. A large volume of business is usually required to support middlemen who engage only in the jobbing of milk. For this reason, they are generally found only in large milk markets. Occasionally milk distributors and dairy manufacturers, in practically all markets, dispose of job-lots of milk to other dealers, but since they do not make a permanent business of jobbing, their supply is somewhat irregular and hence uncertain from the standpoint of the buyer. Furthermore jobbers sometimes distribute to the wholesale trade.

The main sources of supply for cream jobbers are usually areas outside of the regular fluid-milk district, where milk may be bought below the current fluid-milk prices. Since transportation costs favor the shipping of a concentrated product, cream constitutes the bulk of their shipments. Lower transportation rates, resulting from the use of tank ears, have enabled jobbers to supply other markets outside the sphere of the local district much more extensively than was possible previous to the introduction of this method of transportation. It is no longer unusual for whole milk to be shipped in tank ears from Illinois or Wisconsin to distant southern markets. Tank-ear shipments of cream and ice-cream mix produced in mid-western districts are occasionally shipped to eastern points.

The extensive growth in production and consumption, as well as improvement in milk transportation, has enabled jobbers to render a much more valuable service to distribution than formerly. They are often relied upon to supply the emergency needs of milk distributors. Distributors, instead of carrying a large amount of milk in excess of the regular daily demand, may restrict their purchases to normal requirements and depend upon the local jobber for milk and cream when the regular supply is insufficient.



*Milk Brokers.*—Milk brokers are generally found only in our largest cities. In Illinois they are established in the Chicago market. They do not, as a rule, purchase milk outright, but simply establish contact between buyers and sellers of milk. The extent of their service depends principally upon the amount of territory that may be included within the scope of their operations. As is generally true in respect to brokers of many commodities other than milk, they are able to render their greatest service when it is possible to extend their trade transactions beyond the local market. Previous to the introduction of refrigeration and the tank car in milk transportation, the operations of milk brokers were confined almost entirely to the local market. With the present transportation facilities it may become practical, for example, for brokers to establish trade connections between southern dealers and Illinois producers.

### Transportation Agencies

The combined efforts of milk equipment manufacturers and transportation companies have effected valuable improvements in milk transportation. The application of improved temperature-control equipment and modern methods of handling, and the employment of greater economy of space in milk shipments enables milk to withstand shipping periods of one or two days without appreciable changes in quality, and also greatly reduces transportation costs per unit of volume.

Two very outstanding examples of modern equipment are the tank car and tank truck. They not only furnish more volume per unit of space and require less labor in loading and unloading, but are much more effective in protecting milk from the influence of outside temperatures than the equipment which was used formerly. It is evident that the use of this type of equipment has great possibilities, for within the short interval that has elapsed since its introduction a large portion of the milk supply of several of the large milk markets has been shifted to this method of transportation.

Motor transportation has gradually supplanted the horse and wagon as a means of individual direct delivery of milk to pasteurizing plants or receiving stations. Considerable time has been saved by farmers who use the automobile and truck. The producer only a few miles from the plant may deliver milk daily by motor and return to the farm within an interval of approximately half an hour, while two or more hours would be required with horse and wagon. As a rule individual delivery of milk, however, is practical only for farmers who live near the plant or receiving station.

Collective delivery of milk has proved practical in many localities, especially where rail facilities are inadequate. Producers club to-

gether and select one of their number, or employ someone outside the group, to deliver milk for the entire group. In districts where the daily production is small enough so that one man can handle the output of a dozen or more dairies there is more saving than in intense dairy regions. Collective delivery is extensively used in the Peoria district, where there are about a hundred collection routes operating with an average load of approximately 1,200 pounds of milk per route. The routemen enlarge their income by hauling other commodities as well as milk. The plan may be used to haul milk to rail loading points, country receiving stations or plants, and to city plants.

Dealers who transport milk by motor may do so in cases, cans, or tanks. A large percentage of the milk supply produced within 65 miles of Chicago is hauled by motor. In the St. Louis district more than three-fourths of the total fluid milk used is taken to market in this manner. Peoria trucks practically all of its milk. This is also true in Quincy, which ships only about 5 percent of its milk by rail. The fact that the maximum haul is approximately 50 miles makes it practically impossible in these two districts, under present conditions, for any other system of transportation to compete successfully with the method of trucking milk in cans from the farm.

In the trucking zones of Chicago and St. Louis, where a much larger milk supply is available and where the maximum truck haul is more than a hundred miles, the tank truck has partly supplanted the trucking in cans. Tank trucking is a much more economical method of transportation than trucking in cases or cans wherever the volume to be hauled is sufficient. It makes necessary, however, the establishment of country receiving stations, an expense that may sometimes be avoided when milk is trucked in cans. Not only is it possible to haul a much larger volume per load, but less labor is required in loading and unloading.

Dealers who bottle all milk in the country are of course unable to use the tank car for city hauling. In the St. Louis district, where a large portion of the milk supply is bottled in the country, milk is hauled in large trucks which carry approximately 270 cases of 12 quarts each. Even tho bottling milk in the country entails higher transportation costs, the added expense is counteracted by cheaper labor in the country plants. In the Chicago district, where country plant labor is unionized, the tendency has been to reduce the amount of milk bottled in the country. This has been true especially since the introduction of modern methods of transportation. Consumer indifference to country bottled milk has also been a factor.

Very little milk has been transported by rail in the small dairy districts since the development of improved roads and motor transportation. Individual shippers, who produce milk for small markets,



generally have too small a volume to enable steam lines to develop adequate service at a price that will compete with other methods of transportation. Some individual direct rail shipments, however, continue even in small dairy districts.

In intensive dairy sections, where the number of producers is large, considerable milk is shipped direct by rail, by individual producers. More than 10 percent of the St. Louis milk supply is shipped direct by individual producers. During July, 1928, there were approximately 2,200 individual shippers sending milk to the Chicago market. There will always be some producers whose circumstances will favor this method and the number in the Chicago district has probably been reduced near the minimum. Individual shipments are usually carried in baggage cars without refrigeration, a condition which is prohibitory to long-distance hauls. The temperature of the milk is difficult to control in the summer time, shipments during that season being exposed many times to the hot sun at the station platform and to high temperatures in baggage cars. In large markets small dealers who do not operate country receiving stations obtain a large portion of their milk supply from individual direct shippers.

Country milk stations, which on account of location, insufficient volume, or other reasons, do not warrant tank-car shipments, ship their milk by rail in cans to the city processing plants. In the Chicago district the majority of such stations are located more than 65 miles from the city, the greater portion of the milk received at stations within the 65-mile zone being trucked to market. Bottling plants similarly located also use rail lines to ship milk to market. The cost per unit of shipping bottled milk to the Chicago and St. Louis markets from country plants averages more than twice as much as the cost of 10-gallon can shipments in cars (Table 7).

The introduction of the tank car into the field of milk transportation has exerted a great influence upon dairying, particularly in certain localities. Approximately 55 percent of Chicago's total supply is brought to market in them (Table 6). Daily shipments in tank cars to Chicago are made from milk production centers more than 300 miles distant. The hauls range from about 25 to 360 miles. More than 250 of these cars are now operating in the Chicago district, the majority of them being used for bringing whole milk from the country receiving stations to city bottling plants. Even cities in the south have been served with milk from the Chicago district by means of these cars; and it is doubtful whether, without their use, Chicago dealers could have obtained an adequate supply of milk from tested cows at the time the ordinance was enforced which required all milk sold in Chicago to come from cows reacting negatively to the tuberculin test.

Every car is equipped with two glass-lined tanks, each tank having a capacity of about 25,000 pounds. These tanks are well insulated,

TABLE 6.—MANNER OF TRANSPORTING CHICAGO'S MILK SUPPLY, APRIL 1, 1928<sup>1</sup>

Method	Percentage of total supply
Tank cars.....	55.5
Tank trucks.....	20.0
Enclosed trucks (cans).....	17.0
Rail (bottled and cans).....	7.5
	100.0

<sup>1</sup>Figures obtained from records of dairy division of Chicago Health Department.

making it possible to haul milk for miles with but a slight change in temperature. Tests have shown the average change to be only 2 degrees to a hundred miles under normal weather conditions. Manufacturers are now leasing tank cars to dealers who do not care to buy them. This is especially advantageous to small dealers who have a limited amount of capital. The initial cost, however, is not large considering the utility and durability of the car and the saving in transportation costs that result from its use, tank-car rates being approximately one-third lower than 10-gallon can rates (Table 7).

Aside from the advantage of lower rates, tank cars dispense with considerable labor in loading and unloading, since the milk may be pumped into and out of them. There are, of course, limitations to their use. Owing to their very recent introduction, many dealers are not wholly prepared for their immediate adoption on a large scale. Not all city milk plants are located on rail switches so as to permit unloading directly from the car into the holding vats of the plant, nor are all of the receiving stations situated so as to have easy access to rail transportation. Large central stations, however, may be constructed at rail shipping points, and milk from stations not favorably located for rail transportation may be trucked in tank trucks to the central rail shipping center. In districts where the daily receipts of a station are not large enough to approach tank-car capacity, tank trucks may be used to truck the milk from two or more smaller stations to the central shipping station and thereby make it possible to load the car to its rated capacity.

### Milk Dealers' Bottle Exchanges

In the process of city milk distribution, milk bottles are separated from the owners in a variety of ways. Retail and wholesale milk buyers may purchase milk from several different sources, either directly from dealers or indirectly thru stores. The routemen generally do not take the time to inspect the name, brand, or trademark on the bottle, but collect all that are left for them. Milk bottles often pass into the hands of traders and may be sold to unscrupulous milk

TABLE 7.—RAILROAD RATES<sup>1</sup> FOR TRANSPORTING MILK FROM OUTLYING SHIPPING POINTS TO CHICAGO AND ST. LOUIS, APRIL 1, 1928

Town	Miles by rail	Cents per 100 pounds			Percentage tank rate is of can rate
		Cases <sup>2</sup>	10-gallon cans	Tank car 40,000 pounds minimum	
To Chicago from:					
Palatine..... Ill.	26.1	46.5	31.4	21	66.9
Manteno..... Ill.	45.0	100.8	34.9	21	60.2
Plato Center... Ill.	46.0	83.3	31.4	21	66.9
Maple Park.... Ill.	50.6	52.3	33.7	21	62.3
Burlington.... Ill.	52.0	83.3	31.4	21	66.9
Spring Grove.. Ill.	54.0	54.3	34.3	21	61.2
Silverlake.... Wis.	60.9	60.1	34.3	24	70.0
Hebron..... Ill.	67.7	54.3	34.3	24	70.0
Teegarden.... Ind.	85.0	106.6	45.9	24	52.3
Mukwonago Wis.	85.4	64.0	37.8	24	63.5
Monterey.... Ind.	86.0	106.6	45.9	24	52.3
Avalon..... Wis.	89.0	65.9	36.6	24	65.6
Janesville.... Wis.	91.1	62.0	40.1	24	59.9
Waukesha... Wis.	106.0	65.9	44.8	25	55.8
Freeport..... Ill.	119.6	71.7	45.4	27	59.5
Slinger..... Wis.	121.8	81.4	44.8	27	60.3
Kewaskum... Wis.	125.6	71.7	45.4	28	61.7
Lena..... Ill.	126.0	127.9	45.4	28	61.7
Servia..... Ind.	127.0	120.2	51.8	28	54.1
Adell..... Wis.	130.0	93.0	45.4	28	61.7
Garrett..... Ind.	151.0	127.9	55.2	31	56.2
Blanchardville Wis.	158.0	127.9	45.4	31	68.3
Appleton.... Wis.	184.2	147.3	50.0	33	66.0
New London Wis.	195.5	151.2	50.0	33	66.0
Holgate..... Ohio	204.0	141.5	60.5	34	56.2
Arpin..... Wis.	258.3	170.5	57.6	37	64.2
Waterloo.... Iowa	275.0	170.5	61.6	37	60.1
To St. Louis from:					
O'Fallon..... Mo.	19.0	69.8	30.2		
Lebanon..... Ill.	25.0	71.7	31.4		
Bunker Hill... Ill.	25.0	81.4	34.9		
Trenton..... Ill.	32.0	79.5	34.3		
Breese..... Ill.	40.0	83.3	37.8		
New Douglas.. Ill.	41.0	83.3	36.1		
Carlyle..... Ill.	49.0	89.1	37.8		
Hillsboro.... Ill.	58.0	93.0	39.5		
Irving..... Ill.	62.0	96.9	41.9		
Ramsey..... Ill.	76.0	102.7	44.2		
Westervelt... Ill.	98.0	112.4	47.7		
Effingham.... Ill.	101.2	114.3	49.4		

<sup>1</sup>Obtained from company tariff sheets. <sup>2</sup>Cases may contain 12 quarts, 24 pints, or 48 half-pints. Both case and can rates are for less than carlots.

dealers, who make a practice of using bottles marked with trade names or insignia other than their own.

Milk dealers in large milk markets generally have considerable difficulty in retrieving bottles which have been misplaced or have otherwise

passed from their possession, unless some effective means is provided for such a purpose. In an endeavor to cope with such a situation, dealers in some markets have formed organizations, generally known as bottle exchanges, which recover stray milk bottles and return them to their rightful owners. Such organizations usually prohibit members from using any bottles other than their own. They also are instrumental in obtaining from dealers outside of the organization bottles belonging to members of the organization. This is possible because of laws and ordinances requiring that dealers refrain from using bottles branded with markings other than their own in dispensing milk. If some agency did not intervene in this way, a small percentage of dealers might provide practically all the bottles used in a particular locality.

The history of the bottle exchanges shows that success depends largely upon type of management, the spirit of cooperation of individual members, and the number of members. It is generally considered essential that the total membership of a milk dealer's bottle exchange represent the major portion of the distribution, otherwise the exchange may find difficulty in accomplishing the purpose for which it was organized.

Since its organization in 1919 the Chicago Milk Dealers' Bottle Exchange has been successful in developing an annual exchange of more than 57 million bottles. For the past six years this organization has delivered a yearly average of more than 42 million stray bottles to the milk dealers of the city (Table 8). Under the terms of agreement, each member is permitted to purchase one share in the

TABLE 8.—BOTTLES RETURNED ANNUALLY TO CHICAGO DEALERS BY MILK DEALERS' BOTTLE EXCHANGE, 1922-1927

Year	Bottles returned
1922.....	28 121 155
1923.....	33 622 267
1924.....	37 911 794
1925.....	46 320 898
1926.....	48 638 691
1927.....	57 662 117
Average.....	42 046 154

NOTE.—See Table 46 in the Appendix for data on losses of bottles and other containers in 1926.

Exchange for each milk wagon license required and obtained in his particular business. The dealer is required to sign a written agreement not to use in his business bottles branded with any name, brand, trademark, or symbol other than his own, nor to authorize or willingly permit other dealers to use bottles branded with his markings.

He also agrees to permit representatives of the Exchange to search for, inspect, and collect all bottles branded with markings other than his own. The first violation of any part of the agreement relative to misuse of trademarks makes the dealer liable to a fine of not to exceed \$100, and a second violation may result in a cancellation of the contract for the Exchange's services. In collecting bottles, it rarely happens that much resistance is encountered, but when such a condition arises and cannot be overcome without legal procedure, a writ of replevin is generally served upon the illegal possessor.

After the bottles have been assembled at the exchange plant and those of each dealer separated, they are delivered to the original owner, who is charged one and one-half cents per bottle for the service. The dealer in turn receives three-fourths of a cent each for all bottles other than his own that are accepted by the organization.

In the Chicago market the most serious difficulties which formerly resulted from the use of milk bottles have been surmounted. Practically all the dealers are members of the organization and, with few exceptions, comply with its provisions. Unscrupulous dealers who use bottles other than their own are rare exceptions.

### Municipal Health Departments

The prime consideration in a food for human consumption is its wholesomeness. This is especially true of milk, which is universally regarded as being indispensable to child growth and development. Public interest in the wholesomeness of food and drink has resulted in the creation of municipal health departments in our larger cities. The service rendered by a well-organized health department and the responsibility of such a department to the public are immeasurably great. Recognition of these facts by municipal health authorities has greatly reduced the death rate in our large cities.

A large portion of the time and effort of health bureaus is spent in the creation and enforcement of regulatory measures which tend to the development and maintenance of wholesomeness in milk. The past five years have witnessed remarkable accomplishments in this direction in Illinois markets.

By far the larger part of all the milk consumed in the large markets of the state is pasteurized, as shown by the data in Table 9. Even in cities where pasteurization is optional, pasteurized milk is gradually supplanting raw milk in response to public preference. It is generally true, within certain limitations, that the larger the city, the greater the precautions which are taken in handling milk. In most of these larger markets where pasteurization is compulsory, frequent checks are made to determine the efficiency of pasteurization. Pasteurization temperature records are kept, and milk samples procured by



TABLE 9.—MISCELLANEOUS DATA PERTAINING TO QUALITY OF MILK<sup>1</sup> CONSUMED IN ST. LOUIS AND CERTAIN ILLINOIS CITIES, JANUARY 1, 1928

Cities	Number of milk pasteurizers	Percentage of milk pasteurized	Prevailing test of milk consumed	Compulsory pasteurization	Tuberculin test ordinance	Population estimate
Aurora.....	6	100	.....	Yes	Yes	47 000
Bloomington...	3	90	.....	No	No	40 000
Chicago.....	190	100	3.5	Yes	Yes	3 150 000
Danville.....	6	75	.....	No	Yes	40 000
Galesburg.....	3	33	.....	No	Yes	25 000
Jacksonville...	3	75	.....	No	Yes	16 000
Joliet.....	22	100	3.8	Yes	Yes	43 800
Peoria.....	5	94	3.7	No	Yes <sup>2</sup>	100 480
Quincy.....	4	70	3.5	No	No	39 131
Rock Island....	8 <sup>3</sup>	91	.....	No	No	42 000
St. Louis.....	38	98	3.8	No <sup>4</sup>	Yes <sup>5</sup>	821 000

NOTE.—The information in this table was obtained from city health departments.

<sup>1</sup>Certified milk has not been considered in this table. In some markets between 1 and 2 percent of the total milk consumed is certified. <sup>2</sup>Effective June 1, 1928. <sup>3</sup>Part of milk distributed in Rock Island is pasteurized in Davenport and Moline. <sup>4</sup>Maximum bacterial count allowed on milk consumed in raw state is about 50,000. <sup>5</sup>Effective March 21, 1930.

municipal health inspectors are tested for numbers of bacteria. The maximum bacterial count that is allowed varies among the different markets. The score card is generally used in grading milk plants. Furthermore, in certain districts the health departments specify the type of equipment which they regard as essential to efficient pasteurization and enforce its use.

Several cities in the state have enacted ordinances requiring that all milk and cream for fluid consumption be supplied from cows which react negatively to the tuberculin test. The consumption of tuberculosis-free milk is regarded as particularly important in districts where raw milk is consumed.

*Illinois Model Milk Ordinance.*—The Illinois Department of Public Health, with the cooperation of the State Department of Agriculture, has drafted what may be termed a model milk ordinance, which is now available for the consideration of interested parties and organizations, particularly health and food departments of Illinois municipalities. While the ordinance may require some modifications to meet local conditions, it nevertheless serves as a guide for drafting municipal regulations. Following is a brief digest of the more important provisions of the ordinance.

Those who engage in the business of dispensing milk to the trade are required to secure a license upon payment of a small fee. Administration of the ordinance is under the jurisdiction of the municipal health department, which is permitted to use its own discretion when emergencies arise that are not considered in the ordinance. Quantities of regular milk of less than gallon lots when sold to the retail trade must be sold in containers with the net contents and distributor's name thereon. This provision not only dispenses with the dipping of milk on routes, which may result in spreading of contagious diseases, but requires that each dealer

use only his own containers. As would be expected, adulteration of milk in any manner whatsoever is strictly forbidden. It is provided that milk which is sold for consumption in the raw state should be derived from healthy cows, as determined by veterinary inspection, and shall not contain more than 100,000 bacteria per cubic centimeter. Raw milk, like pasteurized, must be labeled as such on the container or part thereof. Persons on farms and in dairies who handle raw milk must not only be free from contagious diseases, but those who have previously had typhoid or paratyphoid fever must show by medical examination that they are not carriers of these diseases. The requirements regarding the sanitation of premises, equipment, and containers undoubtedly are conducive to a clean and safe milk supply. The board of health created by this ordinance is empowered with the right to prosecute any violations of its provisions.

Altho this model ordinance is probably better adapted to conditions in the average size of market, than in the large market, it includes many of the fundamental requirements for the safeguarding of the milk supply of any city, large or small.

*Regulations in the Chicago Market.*—Following are some of the more important activities in which the Chicago Health Department has engaged for the purpose of providing a wholesome supply of milk to the city.

1. Strict enforcement of pasteurization of all milk.
2. Chemical and bacteriological inspection of milk supply.
3. Enforcement of an order requiring that all milk and cream served in restaurants and similar eating places be supplied in bottles, or other containers, sanctioned by the Health Department.
4. Prohibition of hand-capping of milk bottles.
5. Enforcement of an order requiring that all trucks hauling milk from the country be equipped with properly ventilated and enclosed truck bodies.
6. Establishment of maximum temperature limitations for raw milk coming into the city.
7. Periodical surveys of milk and cream sold in Chicago.
8. Engineering survey of pasteurizing equipment to determine the extent of defects, if any.
9. Adoption of an ordinance requiring that all cattle supplying milk for the Chicago market react negatively to the tuberculin test.
10. Maintenance of country dairy registration and inspection, including inspection of country milk plants and dairies.

Following is a copy of the recent amendment to the Chicago health code prohibiting the sale of milk from cows which develop a positive reaction to the tuberculin test:

“All milk, cream, skim milk, or buttermilk which shall be delivered into, sold, offered for sale, or distributed for purposes of food, in the City of Chicago shall be from healthy cows free from disease. For the purpose of determining the condition of such cows, each and every animal in the herds from which milk shall be obtained shall be certified by veterinarians authorized by the commissioner of health, and shall have been examined within one year of the time when milk is accepted therefrom. The commissioner of health may also consider certification from other veterinarians when the herd is under State or Federal supervision and shall have been examined within a like time. The examination to be made of such animals shall be of such a character as to enable the veterinarian to determine whether the animal is free from contagious or infectious diseases of all kinds and to certify thereto. The test may be repeated when it is deemed advisable or



necessary by the commissioner of health. In case such examination is under Federal or State authority the owners of the herds may obtain certificates or blanks from the commissioner of health for purposes of certification by such Federal or State Veterinarians. Any cow added to a herd that has been examined and on which a certificate has been issued shall be examined when it is first added to the same. All cattle found to be unhealthy shall be immediately excluded from the herd which is certified as hereinbefore provided, and any milk therefrom shall be withheld from the market. Any diseased animal found in the herd at any time shall be entirely removed from the premises wherein the certified herd is kept within thirty days after the discovery of such disease."

*St. Louis Regulations.*—On March 21, 1928, the city of St. Louis, which secures approximately 80 percent of its total milk supply from Illinois producers, approved a new milk ordinance requiring that after March 21, 1930, which is two years from the date of approval, all of its milk supply must be produced by cows free from tuberculosis as determined by the tuberculin test. Beginning April 21, 1928, however, the tuberculin test requirement became effective for cows that produce fluid milk for consumption in the raw state. Practically all other provisions became effective one month from date of approval.

Altho pasteurization is not absolutely compulsory in the St. Louis district, it is practically so, since very rigid restrictions are placed upon milk that is consumed in the raw state. The maximum bacterial count allowed for such milk is approximately 50,000 bacteria per cubic centimeter. Strict control is maintained upon the entire milk supply from farm to ultimate consumer. A medical inspection is required annually for every person connected with a dairy or milk plant whose work brings him in contact with the production, handling, storage, or transportation of milk or milk products. Rigid enforcement of the above provisions and all similar ones that are now effective should provide a safe milk supply of high quality for this district.

*Peoria and Quincy Regulations.*—Strict enforcement of the new milk ordinance of Peoria which became effective June 1, 1928, should assure a milk supply of high quality. The ordinance not only provides that the milk be produced and handled under proper sanitary conditions but also that it be supplied by cows that react negatively to the tuberculin test. Even tho pasteurization is not required in Quincy, 70 percent of the milk supply is pasteurized.

## ASSEMBLING AND PROCESSING PLANTS

Expansion of markets and changes in the standard of milk quality are largely responsible for our present complex system of distribution in which many agencies and instrumentalities are employed. In some of the large markets of the state the demand for milk is now so large that the outer boundaries of production areas have been extended a hundred miles or more beyond the local consumption centers. In such districts, country milk plants including receiving stations and

pasteurizing plants have been established by jobbers and dealers for the purpose of facilitating the process of marketing (Fig. 8). Only a small portion of the milk supply of Illinois markets is pasteurized in the country, by far the greater majority of the pasteurizing plants being located in cities.

### Country Milk Plants

*Chicago District.*—Eighty-five of the 242 plants which receive milk outside of Chicago for consumption in this market operate pasteurizers (Table 10). Altho Illinois supplies a large amount of the fluid milk consumed in Chicago, there are fewer country pasteurizers and receiving stations in this state relatively than in Wisconsin. A large portion of the Illinois area that regularly produces for the fluid-milk market is close enough to Chicago so that milk is trucked directly to

TABLE 10.—NUMBER AND LOCATION OF COUNTRY PLANTS HANDLING MILK AND CREAM UNDER SUPERVISION OF CHICAGO HEALTH DEPARTMENT<sup>1</sup>,  
JANUARY 1, 1928

State	Pasteurizers		Receiving stations	
	Number	Percentage of total	Number	Percentage of total
Illinois.....	15	17.6	31	19.8
Wisconsin.....	58	68.2	108	68.8
Indiana.....	6	7.1	14	8.9
Michigan.....	4	4.7	4	2.5
Iowa.....	1	1.2	.....	.....
Ohio.....	1	1.2	.....	.....
Total.....	85	100.0	157	100.0

<sup>1</sup>The number of country plants in operation varies during the year, many more operating in the summer than in the winter.

city. All these country plants, regardless of their location, are required to comply with Chicago Health Department regulations. Only a part of these pasteurizers are bottling plants. The practice of bottling milk in the country is not engaged in so extensively as formerly. It increases transportation costs, as case shipments are much more costly than those by way of can or tank. Cooling expenses, chiefly for ice and refrigeration, are materially increased. Plant overhead costs are usually greater than they would be if this milk were bottled in connection with that bottled in the city. The disadvantages of such a practice apparently greatly outweigh the advantages, especially since consumers have appeared to be rather indifferent to the slogan "bottled in the country."

*St. Louis District.*—About 68 percent of the total St. Louis supply is handled thru country milk-receiving stations, of which there are

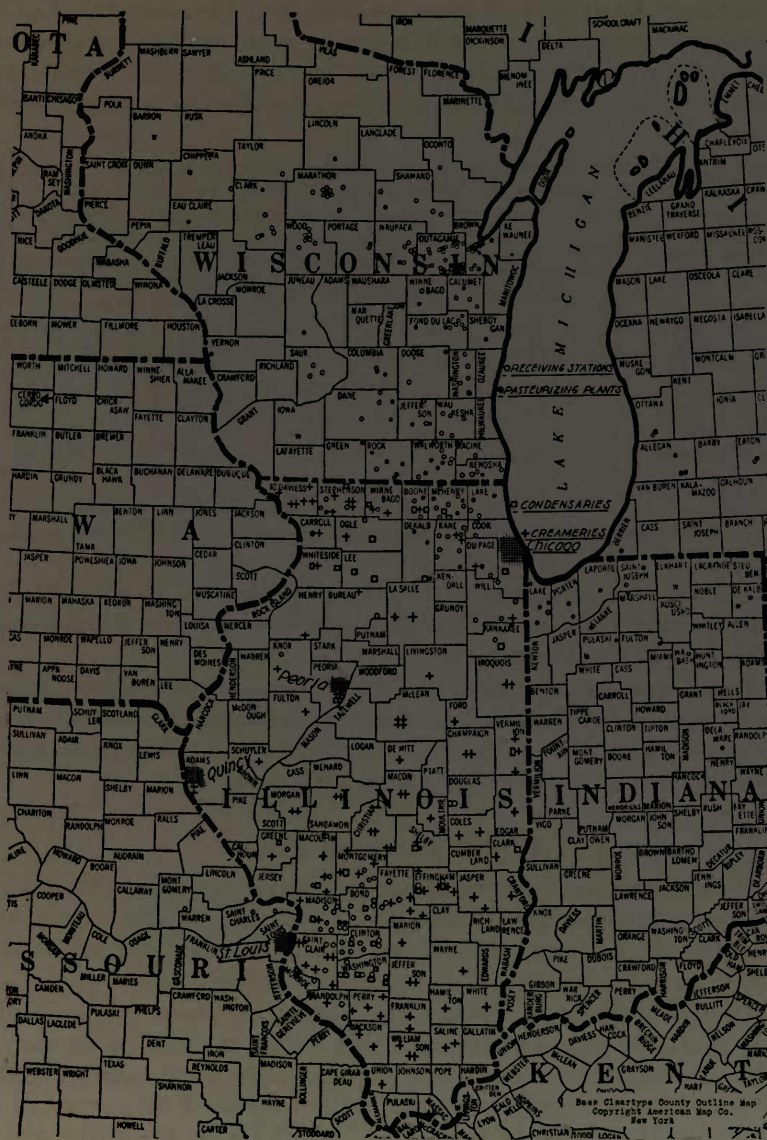


FIG. 8.—MILK PLANTS IN ILLINOIS AND NEIGHBORING STATES, JANUARY 1, 1928

In the territory outside of Illinois only those country receiving and processing plants that supply the Chicago and St. Louis markets are shown. Many of the plants handling milk for fluid consumption in Chicago are more than 200 miles from the city. Forty-nine of the 53 stations receiving milk for St. Louis are located in Illinois.

fifty-three. Forty-nine of these are located in Illinois. Three of the forty-nine pasteurize and bottle milk. A great majority of these stations receive less than a thousand gallons of milk daily (Table 11). About two-thirds of the milk supply is handled by stations having

TABLE 11.—NUMBER AND CAPACITY OF COUNTRY RECEIVING STATIONS HANDLING MILK AND CREAM IN ST. LOUIS DAIRY DISTRICT<sup>1</sup>, JANUARY 1, 1928

Gallons received per day	Number of receiving stations	Percentage of receiving stations in each group	Percentage of total milk received	Accumulative percentage of milk received
1- 300.....	5	9.43	1.67	1.67
300- 500.....	11	20.76	8.05	9.72
500- 800.....	15	28.30	15.83	25.55
800-1,000.....	5	9.43	7.84	33.39
1,000-2,000.....	12	22.64	29.01	62.40
2,000-5,000.....	4	7.55	19.61	82.01
5,000 and over..	1	1.89	17.99	100.00
Total.....	53	100.00	100.00	.....

<sup>1</sup>Three of these receiving stations also operate pasteurizers and bottling plants.

a daily capacity of more than a thousand gallons. Besides the four milk-receiving stations in Missouri, there are also two other stations which handle sweet cream only.

*Peoria and Quincy Districts.*—The nearness of production areas to the Peoria and Quincy markets renders it unnecessary to operate country receiving stations. The milk supply of these two cities is hauled directly from farm to the city plants of dealers.

### City Pasteurizing Plants

Illinois consumers are becoming more particular about milk quality. They no longer tolerate the dipping of milk and usually require that it be pasteurized. As a result, pasteurizing and bottling plants have become an essential part of the machinery of distribution.

*Chicago.*—The milk dealers of Chicago, of whom there are 196, were operating 190 pasteurizing plants within the city on January 1, 1928. A majority of these are located on the south side (Fig. 9). Eleven of the pasteurizing plants handle more than 50 percent of all the fluid milk consumed (Table 12). About 25 percent of the dealers pasteurize between 100 and 200 gallons daily. The number of small dealers in the Chicago market, however, has been decreasing within the past few years. Mergers among them have been rather frequent, especially since the enforcement of regulatory measures in milk processing and the action of other factors increasing the costs of distribution. Under present conditions it is rather difficult for dealers



FIG. 9.—FLUID-MILK PASTEURIZING PLANTS AND ICE-CREAM FACTORIES IN CHICAGO, JANUARY 1, 1928

Very few pasteurizers in the city handle more than 15,000 gallons of milk daily. Most of the ice-cream factories are located near the center of the city, where consumption is greatest and where railroad terminals are convenient.

in this market to maintain their business unless their volume of trade is large enough to make possible low overhead costs.



TABLE 12.—NUMBER AND CAPACITY OF PLANTS IN CITY OF CHICAGO WHICH PASTEURIZE MILK FOR FLUID CONSUMPTION, JANUARY 1, 1928

Gallons pasteurized per day	Number of pasteurizers	Percentage of pasteurizers in each group	Percentage of total milk pasteurized	Accumulative percentage of milk pasteurized
1- 100 ..	26	13.69	.60	.60
100- 200 ..	48	25.26	2.22	2.82
200- 300 ..	21	11.05	1.62	4.44
300- 500 ..	19	10.00	2.26	6.70
500- 1,000 ..	22	11.58	4.91	11.61
1,000- 5,000 ..	43	22.63	28.79	40.40
5,000-15,000 ..	6	3.16	15.54	55.94
15,000-and over.	5	2.63	44.06	100.00
Total.....	190	100.00	100.00	.....

*St. Louis.*—There are thirty-eight plants operating in St. Louis and two plants in East St. Louis which pasteurize milk for fluid consumption (Fig. 10). Two large pasteurizers at Highland, Illinois,



FIG. 10.—PLANTS PASTEURIZING MILK FOR FLUID CONSUMPTION IN ST. LOUIS AND EAST ST. LOUIS, JANUARY 1, 1928

More than 75 percent of the pasteurized milk consumed in East St. Louis is handled by plants in St. Louis and in Highland, Illinois.

and a smaller one at Waterloo supplement the milk supply of these plants. Their entire output, however, is not consumed within the city itself; a small portion is used to supply the suburban trade. East St. Louis, with approximately 80,000 inhabitants, depends chiefly upon the plants of St. Louis for its pasteurized milk. The relative amounts of milk handled by the pasteurizers are indicated in Table 13.

TABLE 13.—NUMBER AND CAPACITY OF PLANTS IN ST. LOUIS DAIRY DISTRICT WHICH PASTEURIZE MILK FOR FLUID CONSUMPTION, JANUARY 1, 1928<sup>1</sup>

Gallons pasteurized per day	Number of pasteurizers	Percentage of pasteurizers in each group	Percentage of total milk pasteurized	Accumulative percentage of milk pasteurized
1- 100 ..	7	16.28	.59	.59
100- 200 ..	11	25.59	1.74	2.33
200- 300 ..	5	11.63	1.52	3.85
300- 500 ..	2	4.65	.75	4.60
500- 1,000 ..	8	18.60	6.16	10.76
1,000-10,000 ..	8	18.60	31.22	41.98
10,000 and over	2	4.65	58.02	100.00
Total.....	43	100.00	100.00	.....

<sup>1</sup>Thirty-eight of the pasteurizers are located in the city of St. Louis, two in East St. Louis, two in Highland, Ill., and one in Waterloo, Ill.

A small portion of the milk consumed in St. Louis and suburbs is not pasteurized. There are eighteen milk peddlers in St. Louis and fourteen in East St. Louis who do not operate pasteurizers but either purchase milk from dealers or produce it in city dairies. The milk output of the producer dairies in the two cities is consumed chiefly in the raw state. As has been previously stated, this source of supply is only a very small part of the total consumption.

*Peoria and Quincy.*—There are five pasteurizers operating in Peoria and four in Quincy (Table 9). Peoria consumes about 94 percent of its milk in the pasteurized state, Quincy about 70 percent.

## STATISTICS OF CONSUMPTION

Differences in food habits is one of the most important factors affecting the rate of milk consumption in the different markets. Thus the preponderance of a certain nationality in a particular district may be the determining factor in the amount of milk consumed. Some nationalities prefer a large amount of milk in the diet for both adults and children, while others restrict its consumption largely to children. Generally speaking, however, the American people, regardless of the

TABLE 14.—DAILY PER CAPITA CONSUMPTION OF MILK IN CHICAGO, ST. LOUIS, AND PEORIA MARKETS  
(Based on data for November and December, 1927)

	Total daily sales for all dealers	Estimated percentage dealers' sales are of total consumption <sup>1</sup>	Total consumption (calculated)	Prevailing butterfat content of milk distributed <sup>2</sup>	Total con- sumption on 3.5-percent milk base	Estimated population served January 1, 1928 <sup>3</sup>	Per capita consumption on 3.5-per- cent milk base <sup>4</sup>
Chicago Milk only: November, 1927.....	<i>pints</i> 2 396 672	<i>percl.</i> 95	<i>pints</i> 2 522 813	<i>percl.</i> 3.5	<i>pints</i> 2 522 813	3 150 000	<i>pints</i> .801
St. Louis Milk only: December, 1927.....	493 592	98	503 665	3.8	546 836	821 000	.666
Peoria Milk and cream: December, 1927	58 232	90	64 702	3.7	68 399	100 480	.681

<sup>1</sup>Dealers' sales did not include all the milk consumed in each market, as a few hotels, restaurants, and other similar places ordered their milk direct from the country. In Peoria and St. Louis raw milk was distributed by peddlers.

<sup>2</sup>The prevailing butterfat content does not apply to all dealers; there are exceptions, some dealers distributing lower testing milk, others higher testing milk.

<sup>3</sup>No allowance has been made for the amount of milk consumed by the transient trade, since it is practically impossible to secure information on which to base an accurate estimate. At any rate, it would affect only slightly the results were it used in the calculation.

<sup>4</sup>For the sake of comparability, the per capita consumption estimates in the table have been expressed in terms of milk containing 3.5 percent of butterfat. Expressed in terms of the milk that was most generally delivered, the per capita consumption figures would read: Chicago, .801 pint; St. Louis, .613 pint; Peoria, .644 pint.

native food habits of the country from which they or their ancestors emigrated, are recognizing more and more the value of milk in the diet, and milk is taking its place as an essential family food.

### Per Capita Consumption in Three Markets

The per capita consumption of milk in the country as a whole has been gradually increasing. According to Yearbooks of the U. S. Department of Agriculture, in the ten-year period from 1917 to 1926 the per capita consumption of milk for household purposes increased 31 percent. Per capita consumption in cities is less than on farms. During 1924 the average for all cities was 35 percent less than the average in rural communities according to the same source.

In Table 14 is given the estimated per capita consumption of Chicago, St. Louis, and Peoria, based on data gathered in the present study. Since the butterfat content of the milk distributed in these markets varied somewhat, all estimates have been converted to the common basis of milk containing 3.5 percent of butterfat. Calculations were made on the basis of the prevailing milk tests shown in Table 9, it being practically impossible to arrive at an exact average butterfat test for all the milk distributed in each market.

Except in the Peoria district, these refer to sales of fluid milk alone. The Peoria estimate refers to both milk and cream because a separate record of the amounts used for each product was not available.

The total daily sales of all dealers was used as a basis in calculating the total amount of milk consumed in each district. City dealers did not always handle all the milk for the city trade; jobbers and others outside of the city supplied a relatively small amount direct to hotels, restaurants, and other similar places. It was estimated, however, that dealer's sales represented 95 percent of the total consumption in Chicago, 98 percent in St. Louis, and 90 percent in Peoria. Total consumption figures were therefore divided by the population served on January 1, 1928, to obtain the per capita consumption.

Altho the price of milk was highest in the Chicago market, more was consumed per capita in that market than in either of the other two markets. Chicago consumed .801 pint of milk per capita, St. Louis .666 pint, and Peoria .681 pint of milk and cream combined. The per capita consumption of both milk and cream in Peoria was even less than that of milk alone in Chicago. These facts indicate that the possibilities of increasing the rate of milk consumption in the cities of Peoria and St. Louis are rather promising, especially since raw product and distribution costs are low enough to enable dealers in these two markets to sell milk cheaper than in Chicago. The high

rate of milk consumption in Chicago is indicative of the effect which public confidence in milk quality has upon market demand. When we consider that no serious epidemic has been traced to the milk supply in this territory within recent years, it appears evident that this confidence has been well founded. Altho improvements in quality necessitate increased costs which must be met by higher prices to the consumer, the fact that higher quality has led to a higher per capita consumption would seem to indicate that the improvements have been in compliance with consumer demand.

### Trend in Chicago Sales

Some general idea regarding the increase in milk and cream consumption in Chicago for the five-year period from 1922 to 1926 may be obtained by referring to Table 15.<sup>1</sup> These calculations are based

TABLE 15.—TREND IN MILK AND CREAM SALES IN CHICAGO, 1922-1926  
(Average daily sales per year for five-year period used as base<sup>1</sup>)

	Percentage increase per year
Milk	
Quarts, retail.....	5.0
Quarts, wholesale.....	1.7
Pints, retail.....	10.2
Pints, wholesale.....	6.5
Cream	
22-percent, half-pints, retail.....	7.1
32-percent, half-pints, retail.....	5.6

<sup>1</sup>Based upon approximately 30 percent of total distribution.

upon slightly less than one-third of the total distribution. Had total district sales for the five-year period been available, the effect of increases and decreases in volume of business of individual dealers would not have influenced results as it has probably done with the data in the table. Nevertheless, when the general improvement in milk quality that has occurred within the past five years in this market is considered, it would seem that a substantial increase in milk and cream sales should have been the logical result, especially since consumer milk prices have remained practically unchanged for the period.

Retail sales of milk show greater increases than wholesale sales of the same units. Retail quarts during this five-year period increased

<sup>1</sup> For trend in sales of milk and cream previous to the date of this survey, see Bulletin 269 of this Station, "The Marketing of Milk in the Chicago Dairy District," (1925), by H. A. Ross.



an average of 5 percent each year, while wholesale quarts increased only 1.7 percent. It is probable that this difference is due principally to an improvement in retail service and to an increase in the use of household refrigeration, thereby making it possible for milk to be kept in the home thru an entire day without much appreciable change in quality. The fact that milk is becoming more popular as a family food may partly account for the larger increase in pint sales. Formerly it was not unusual for families without children to take a pint of milk at irregular intervals, but since milk is now more generally regarded as being essential to health, it is probable that these families have begun to consume milk more regularly.

Half-pint sales of 22-percent and 32-percent cream increased by 7.1 percent and 5.6 percent per year, respectively.

In studying a series of economic data, it is customary to determine first the tendency of the series to rise or fall with the lapse of time and, second, to determine seasonal variations in the series. Both of these phenomena may be measured rather accurately. In Fig. 11 the results of such a study of the milk sales in the Chicago market are presented. The trend line shows the general tendency of sales to increase during the time indicated (1922 to 1926). The line of "normal" distribution represents what the sales would have been during any particular month if no other influence than the tendency for the sales to increase and the usual seasonal variations had operated.

In Fig. 12 the deviations of the actual sales from the normal line shown in Fig. 11 are expressed in percentages. These deviations, it will be noted, are extremely small in the case of quarts of milk and half-pints of 22-percent cream sold at retail and rather large in the case of the other volumes. Apparently the rate of employment, an index of which is included in Fig. 12, has considerable bearing upon the consumption of the more popular milk and cream units. With certain units the relationship was direct, while with others it was inverse. Sales of quarts of milk, both wholesale and retail, and half-pints of 22-percent cream rose and fell with the rise and fall of the index of employment. The sale of pints of milk was somewhat inversely related to the rate of employment. Consumers apparently regulate the amount of milk purchased so as to harmonize with their income, and as a period of business depression begins many consumers shift their milk purchases from quarts to pints. The rate of milk consumption apparently is highly sensitive to fluctuations in economic activity, and increases and decreases in somewhat close correspondence with periods of prosperity and depression.

The abrupt decline in the sale of pints of milk which began on December 1, 1922, was the result of a one-cent increase in price. The effect of price changes on other units was much less pronounced.

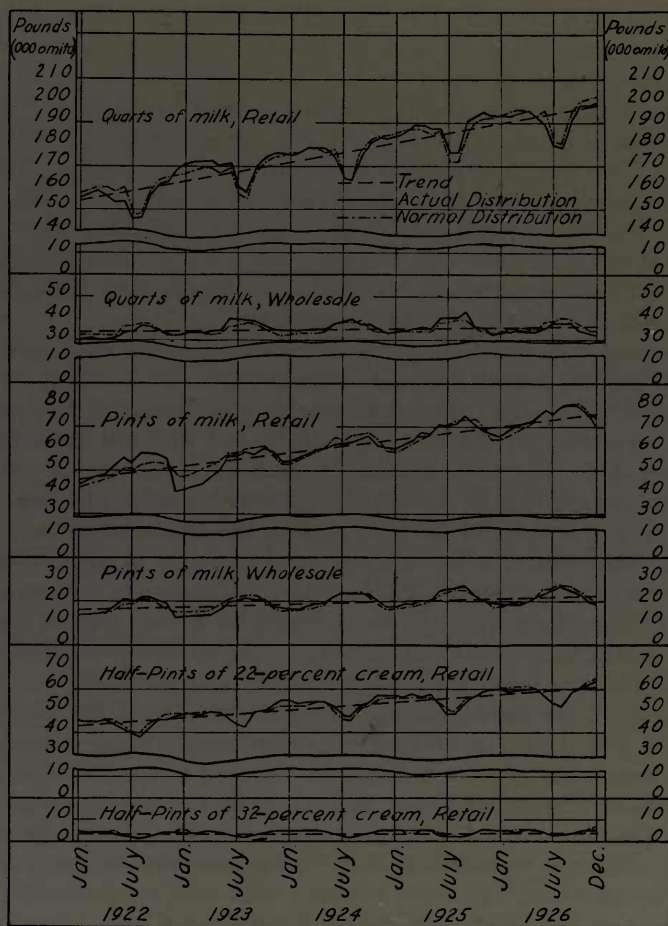


FIG. 11.—MONTHLY VARIATION IN THE CONSUMPTION OF MILK AND CREAM IN THE CHICAGO MARKET FROM 1922 TO 1926

The effect of season and other factors on the consumption of certain units of milk and cream is readily apparent from the curve showing actual distribution. The line of "normal" distribution indicates what the sales would have been during any particular month if no other influence than the tendency toward increasing consumption (trend) and the usual seasonal variations had operated. (All units are reduced to a pound basis for the sake of greater comparability.)

### Seasonal Variation in Milk and Cream Sales

Seasonal factors exert considerable influence on milk and cream sales. In Table 16 and Fig. 13 are shown certain data for the Chicago market. Altho not all units in which milk and cream are sold

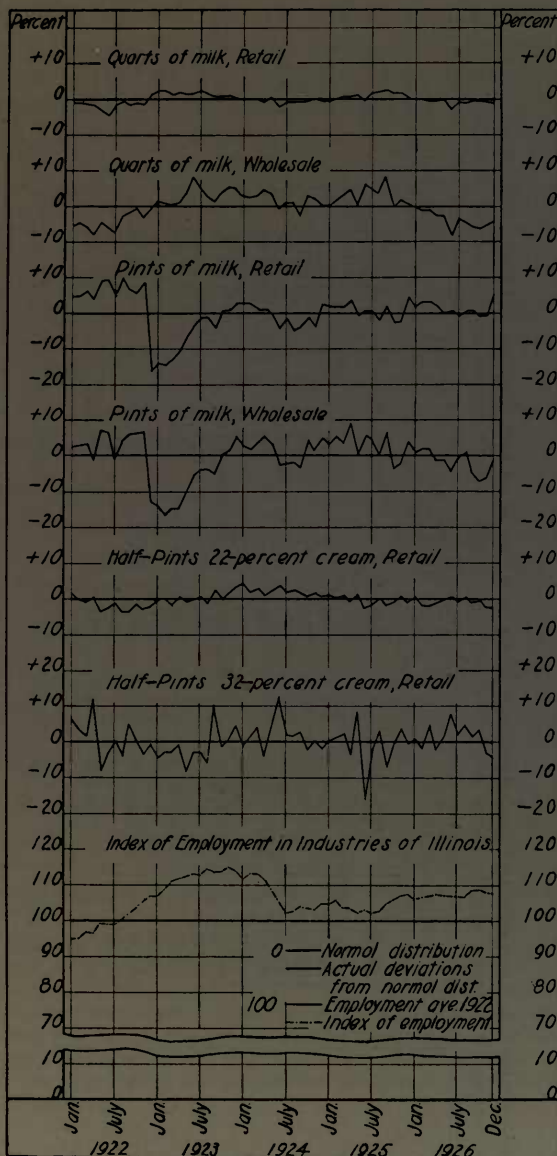


FIG. 12.—COMPARISON OF MILK AND CREAM CONSUMPTION IN THE CHICAGO MARKET, 1922-1926, WITH INDEX OF EMPLOYMENT IN ILLINOIS

The "normal" distribution curve in Fig. 11 is here shown as the base line in each case. The percentage deviation from this normal is shown by the curve. With the exception of half-pints of 32-percent cream, the curve showing consumption follows in a general way the curve of employment. The abrupt decline in pints of milk in December, 1922, was caused by a one-cent raise in price.

TABLE 16.—SEASONAL VARIATION IN CONSUMPTION OF MILK AND CREAM IN THE CHICAGO MARKET, 1922-1926<sup>1</sup>  
(Figures indicate percentage of average monthly sales and are based on an approximate annual distribution of 4 million pounds)

	Milk, quarts		Milk, pints		Cream, half-pints	
	Retail	Wholesale	Retail	Wholesale	Retail 22-percent	Retail 32-percent
January.....	101.9	94.7	90.6	83.3	104.3	122.7
February.....	102.2	95.7	93.0	84.6	103.7	119.7
March.....	102.6	96.1	95.3	85.8	103.7	117.6
April.....	102.0	95.9	98.1	90.7	104.3	124.6
May.....	100.5	96.6	99.8	96.9	102.4	115.9
June.....	101.2	105.8	106.1	111.6	97.3	84.1
July.....	93.3	107.4	103.6	115.9	90.3	62.1
August.....	92.3	109.4	106.6	121.3	87.9	57.1
September.....	98.9	108.7	107.2	119.2	96.4	68.6
October.....	101.4	101.0	106.9	110.3	100.6	91.5
November.....	101.8	96.1	101.1	96.8	103.8	115.9
December.....	101.9	92.6	91.7	83.6	105.3	120.2

<sup>1</sup>Trend removed.

are included, it is believed the data are representative of the market since the units that are included are the most popular ones, by far the greater portion of the total distribution being made in this way.

Retail quart sales of milk, which constitute a large part of all sales, were highest in March (102.6 percent of average) and lowest in

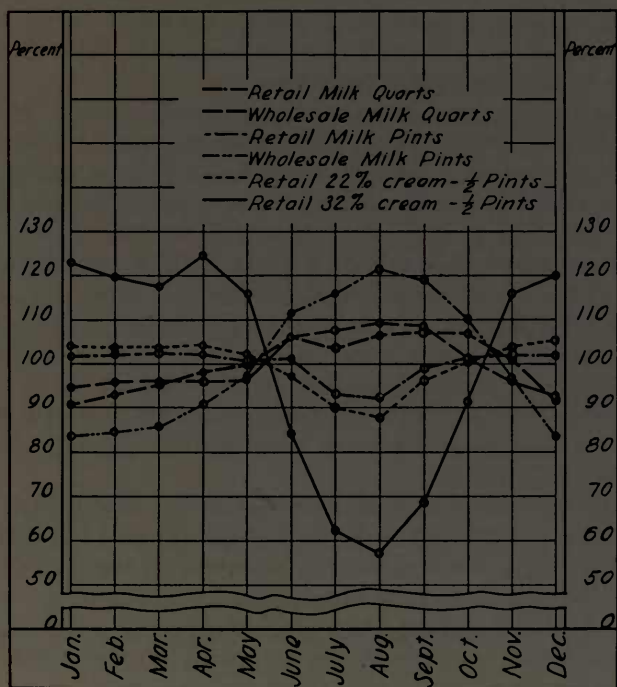


FIG. 13.—SEASONAL VARIATION IN CONSUMPTION OF MILK AND CREAM IN THE CHICAGO MARKET FROM 1922 TO 1926

Sales of milk pints to the wholesale trade were higher in summer than were any of the other units shown in this graph, while retail half-pint sales of 32-percent cream were lowest. The units here shown were the most popular ones with the trade and represent the greater part of total sales. The average monthly distribution for the five-year period was used as the base for calculating the percentage variations. See Table 16. Trend removed.

August (92.3 percent of average). With the exception of retail quarts, milk sales are at a maximum during the summer months, while cream sales are lowest at that time. Wholesale quart sales of milk were approximately 8 percent above average during summer months and retail half-pint sales of 22-percent cream were approximately 9 percent below. Retail quart sales would normally be expected to decline dur-



ing the summer, since many families leave the city on vacations when the schools close. Furthermore, sufficient ice is not always available in every household to keep milk in satisfactory condition thruout the day, and hence many housewives depend upon the neighborhood store for their milk supply. This accounts also for the increases in wholesale distribution of quarts and pints during this period. In addition, workers in various lines of employment, especially in the building trades, generally buy a pint of milk for lunch each day in summer in preference to carrying coffee from home.

Half-pint cream sales show a very noticeable decline in summer. People ordinarily prefer cold drinks during hot weather and thus consume less coffee cream. Sales of 32-percent whipping cream declined much more than those of 22-percent cream, possibly because rich food does not appeal to people so much in the summer season, and the housewife ordinarily does not do a great deal of cooking or making of fancy dishes which require whipped cream. Moreover, when the weather is hot it is more difficult to maintain the temperature of cream at a point at which it will whip readily. Still another factor in the marked decline in the consumption of this type of cream is its use principally by those having a comfortable income and who, therefore, are likely to take vacations away from the city, thus reducing the demand for this product.

The total consumption of milk in each of the four Illinois markets studied varied but little thru the year (Table 17 and Fig. 14). With the exception of St. Louis, minimum consumption occurred during the months of July and August, ranging in the different markets from 93.2 percent to 97.3 percent of average sales for the year, while maximum consumption varied with the particular district. Milk sales in St. Louis were lowest in December.

Third-quarts of milk are not included and the cream data represent only half-pint sales of 22- and 32-percent cream. However, since the half-pint sales unit and these two types of cream are most popular with the trade, data for them should furnish a satisfactory index of total cream consumption.

Cream sales in the four markets, altho rather regular, did not display quite the same degree of uniformity as milk. Without exception, the period of lowest consumption occurred during the month of August and ranged for the different months between 78.4 and 93.6 percent of average sales. The principal factors responsible for this seasonal decline have been discussed above.

For additional information relative to seasonal variation in distribution of various units and types of dairy products see Tables 41, 42, and 43 in the Appendix.

TABLE 17.—SEASONAL VARIATION IN COMBINED WHOLESALE AND RETAIL MILK AND CREAM SALES IN FOUR MARKETS<sup>1</sup>  
(Figures indicate percentage of average monthly sales for period specified)

	Chicago 1925-1926		St. Louis 1924-1925		Peoria 1927		Quincy 1925-1926	
	Milk	Cream	Milk	Cream	Milk	Cream	Milk	Cream
January.....	97.7	105.8	97.3	108.2	99.6	99.6	98.9	105.6
February.....	98.9	103.6	99.4	108.7	100.3	94.7	100.7	107.9
March.....	100.1	103.8	101.2	110.8	102.3	100.7	100.8	113.5
April.....	100.5	105.4	102.5	106.9	98.9	101.3	110.8	111.5
May.....	99.8	106.3	101.6	111.8	97.9	104.3	98.2	104.1
June.....	101.7	96.5	103.4	96.7	96.5	97.7	97.1	99.1
July.....	97.3	89.2	99.7	81.3	96.1	95.4	96.3	85.6
August.....	97.3	88.4	98.5	78.4	93.2	93.6	93.5	85.3
September.....	103.4	94.5	101.5	87.3	96.9	93.9	101.7	90.2
October.....	102.9	99.0	99.9	95.6	104.4	106.1	98.7	92.5
November.....	101.2	103.4	98.9	106.2	107.4	107.3	99.8	101.7
December.....	99.2	104.1	96.1	108.1	106.5	105.4	103.5	103.0
Approximate average annual volume (pounds) on which percentages are based.....	3,660,000	970,000	1,000,000	84,000	105,000	16,000	52,000	3,600

<sup>1</sup>Units included in all districts were: Milk—gallons, quarts, pints, and half-pints; cream (22-percent and 32-percent), half-pints. Milk thirds were not sold in all the districts during the time the data were gathered.

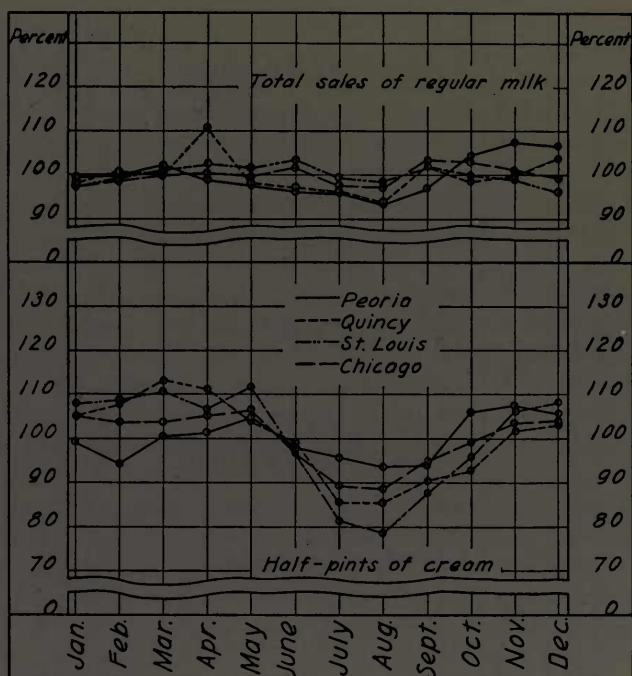


FIG. 14.—SEASONAL VARIATIONS IN MILK AND CREAM SALES IN FOUR MARKETS

Milk sales were fairly uniform thruout the year in all four markets, while cream sales showed considerable decrease during the summer months. All units of measure are included in the "regular" milk sales except third-quarts. Cream sales are based on cream containing 22 and 32 percent butterfat. See Table 17 for base distribution and time intervals. Trend removed.

### Daily Variation in Sales

Scarcely less important than seasonal variations are daily irregularities. The demand for certain units of milk and milk products varies greatly on different days of the week. Whipping cream is an outstanding example of this, the Sunday sales often being greater than those of any three or more other days.

The daily variation in the different sales units of milk, cream, and miscellaneous milk products in the four large markets—Chicago, St. Louis, Peoria, and Quincy—is shown in Tables 18, 19, and 20. The distribution of certified milk was rather uniform (Table 18). Since most of this product is consumed by children, there is no apparent reason why large irregularities in its distribution should occur.

TABLE 18.—DAILY VARIATION IN COMBINED RETAIL AND WHOLESALE MILK SALES IN FOUR MARKETS, 1925-1926<sup>1</sup>  
(Figures indicate percentage of average daily sales and are based on more than 50 percent of the distribution in each market)

	Market	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Certified milk	Chicago.....	96.8	101.0	100.5	100.4	100.4	101.1	99.8
	St. Louis.....	98.5	100.2	101.8	99.7	99.0	99.6	101.2
	Peoria.....	104.6	94.1	98.9	108.5	101.4	98.9	93.6
Pints.....	Chicago.....	86.0	103.5	103.2	104.1	103.8	104.5	94.9
	St. Louis.....	94.9	68.3	99.2	96.8	142.8	100.2	97.8
	Peoria.....	86.9	104.3	101.1	94.0	104.3	107.6	101.8
Pasteurized milk								
	Gallons.....							
	Chicago.....	72.1	102.9	106.4	108.4	103.7	108.8	97.7
	St. Louis.....	89.6	104.9	102.1	103.5	101.8	99.5	98.6
Quarts.....	Chicago.....	67.2	101.2	109.9	111.3	104.8	107.3	98.3
	St. Louis.....	69.3	81.6	130.7	80.7	84.4	84.6	168.7
	Peoria.....							
	Quincy.....							
Pints.....	Chicago.....	97.3	117.6	97.0	96.3	97.8	97.9	96.1
	St. Louis.....	87.5	101.5	102.4	99.7	101.4	99.6	107.9
	Peoria.....	99.8	98.1	98.0	99.9	99.0	101.7	103.5
	Quincy.....	87.8	97.5	107.9	100.6	99.9	102.8	103.5
Half-pints.....	Chicago.....	60.9	107.8	114.6	110.8	111.1	111.6	83.2
	St. Louis.....	67.6	106.0	105.6	104.8	104.7	105.6	105.7
	Peoria.....	66.2	104.4	106.7	108.8	107.9	110.5	95.5
	Quincy.....	78.9	79.6	111.1	107.6	108.4	108.2	106.2
Half-pints.....	Chicago.....	31.9	117.6	126.7	126.0	124.9	120.1	52.8
	St. Louis.....	43.5	120.9	119.8	117.1	119.1	114.8	64.8
	Peoria.....	73.9	104.4	105.0	107.5	102.1	100.6	106.5
	Quincy.....	82.0	67.5	141.1	110.4	105.2	108.1	85.7

<sup>1</sup>Figures for St. Louis and Peoria represent only one year—1925 for St. Louis, 1926 for Peoria.

TABLE 19.—DAILY VARIATION IN COMBINED RETAIL AND WHOLESALE CREAM SALES IN FOUR MARKETS, 1925-1926<sup>1</sup>  
(Figures indicate percentage of average daily sales and are based on more than 50 percent of the distribution of each market)

	Market	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Cream 22-percent, in half-pints	Chicago.....	132.6	89.2	94.7	94.1	98.1	94.1	97.2
	St. Louis.....	107.9	94.6	97.2	96.0	100.1	97.9	106.3
	Peoria.....	128.9	88.2	91.7	94.6	96.9	95.3	104.4
	Quincy.....	90.8	93.9	109.1	98.1	102.3	101.2	104.6
32-percent, in half-pints.	Chicago.....	234.7	56.4	67.2	76.2	88.1	80.7	96.7
	St. Louis.....	232.7	57.1	66.8	74.6	93.5	79.9	95.4
	Peoria.....	369.9	50.6	33.6	63.7	45.0	55.7	81.5
	Quincy.....	174.7	81.9	84.0	71.5	94.5	84.7	108.7

<sup>1</sup>Figures for St. Louis and Peoria represent one year only—1925 for St. Louis, 1926 for Peoria.



TABLE 20.—VARIATIONS IN COMBINED RETAIL AND WHOLESALE SALES OF MISCELLANEOUS DAIRY PRODUCTS ON THE DIFFERENT DAYS OF THE WEEK, IN THE CHICAGO, ST. LOUIS, AND PEORIA MARKETS, 1925-1926<sup>1</sup>  
(Figures indicate percentage of average daily sales and are based on more than 50 percent of the distribution in each market)

	Market	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Cultured milk								
	Quarts.....	72.9	100.1	105.0	107.0	104.0	115.5	95.5
	St. Louis.....	55.3	108.1	106.9	100.4	100.1	107.4	121.8
Pints.....	Chicago.....	86.4	98.4	101.2	104.1	95.0	106.5	108.4
	St. Louis.....	84.6	102.2	102.7	102.6	102.6	103.9	101.4
Half-pints.....	Chicago.....	55.6	106.3	108.3	106.9	109.5	112.5	100.9
	St. Louis.....	79.6	99.8	102.5	103.9	103.9	107.4	102.9
Cocoa drinks								
Pints.....	Chicago.....	12.1	154.9	122.4	121.9	122.2	124.1	42.4
	Peoria.....	24.8	106.1	114.6	120.9	117.0	122.6	94.0
Half-pints.....	Chicago.....	5.7	132.7	137.5	139.2	135.8	127.6	21.5
	Peoria.....	61.1	113.7	114.6	111.2	120.4	105.4	73.6
Cottage cheese								
12-ounce packages.....	Chicago.....	90.7	54.3	84.7	95.4	93.3	163.5	118.1
	St. Louis.....	62.4	70.0	80.0	89.6	86.3	212.9	98.8
Butter								
Pounds.....	Chicago.....	97.1	78.4	92.9	99.7	94.6	97.2	140.1
	St. Louis.....	93.7	86.9	94.9	99.1	95.4	101.3	128.7
	Peoria.....	124.6	70.0	84.1	93.3	92.0	75.3	160.7

<sup>1</sup>Figures for St. Louis and Peoria represent one year only—1925 for St. Louis, 1926 for Peoria.

With the exception of pints and half-pints, the various sales units of regular milk showed a fairly uniform distribution thruout the week in all districts. Maximum and minimum quart sales of regular milk, when expressed in percentages of the daily average of each market, were: Chicago, Monday 117.6 percent, Saturday 96.1 percent; St. Louis, Saturday 107.9 percent, Sunday 87.5 percent; Peoria, Saturday 103.5 percent, Tuesday 98 percent; Quincy, Tuesday 107.9 percent, Sunday 87.8 percent. Workers who make a practice of carrying lunches purchase much milk daily in pints. Consequently on Sundays, when they are not working, the sale of pints drops. Restaurants are large purchasers of milk and serve it chiefly in half-pint bottles. Hence on Saturdays and Sundays, when the trade of restaurants falls off, a drop in half-pint sales results. Saturday sales in Peoria differ from those in the larger markets, possibly because a relatively larger percentage of the workers who eat at restaurants work a full day on Saturday instead of just a half-day as they do in the other cities; thus in Peoria workers contribute to restaurant patronage on Saturday noon as well as on the other days of the week.

With the exception of Quincy, sales of 22-percent cream were greater on Sunday than on any other day of the week (Table 19). Sunday sales of 22-percent cream in these markets exclusive of Quincy, ranged between 107.9 percent and 132.6 percent of average sales. The greater amount of coffee used on this day, plus the larger amount of cream used for dessert, undoubtedly enhances cream sales.

Sunday sales of 32-percent cream were by far the largest of any day. They were about 2.3 times as large as average daily sales in Chicago and St. Louis and approximately 3.7 times average daily sales in Peoria. This would normally be expected, since Sunday dinners are more likely to include salads and desserts which contain whipped cream than are meals of other days of the week. Saturday sales, even tho much smaller than those of Sunday, were above the average of the five previous days.

Less cocoa and cultured milk were consumed on Sundays in the Chicago and Peoria markets than on any other day (Table 20). Excepting Saturday sales of cocoa drinks, sales of cultured milk and cocoa drinks were fairly uniform thruout the week in the markets listed in the table. The fact that these drinks are not generally served in connection with Sunday meals should account for the decreases in Sunday sales. Another factor which would probably cause Sunday sales of these products to be lower than sales on week days is that they are often bought on week days by the working class to supplement the lunch which they bring from home.

Much more cottage cheese was sold on Friday than on any other day, much of it replacing meat then. Exclusive of Saturday, when supplies are purchased for Sunday, butter sales were fairly uniform.

### Demand for Different Sales Units

Thus far the discussion has been confined to certain factors that affect the *rate* of consumption, and nothing has been said regarding the ratio of sales among the various units. Consideration of this relationship is essential to a proper understanding of costs and margins, since profits vary among the various units. The ratio of the sales of pints to quarts, for example, is an important factor affecting dealer's profits, since pints are generally sold at a loss and quarts at a profit, as explained on pages 260 and 261.

Altho data were not obtained for exactly the same periods in the different markets, the periods and data that follow are sufficiently comparable to bring out the difference among the markets.

*Quarts Most Popular Unit for Milk.*—The most popular unit of measure in wholesale and retail sales of regular and cultured milk is the quart (Table 21). Retail quart sales in the Chicago, St. Louis, and Peoria markets were approximately 85 percent of the total retail sales of regular milk. Wholesale quart sales varied from 45 percent to 67 percent of the total. A quart bottle is not so large but that it can be conveniently handled. Hence a family that uses three-fourths of a gallon of milk daily is supplied in three quart bottles instead of in a single container. A pint of milk daily, whether regular or cultured, is usually an insufficient amount for the requirements of the average family and furthermore, milk when purchased in pint volumes is generally more expensive than when purchased as quarts, a pint usually selling for more than one-half the quart price. These and other factors account for the fact that approximately six times as much retail milk and three times as much wholesale milk is sold in quarts as in pints. With respect to cultured milk containing no butterfat, another probable cause for quarts being so much more popular than other units of measure is that the quart price—usually ten cents—is generally considered reasonable.

With the exception of St. Louis, both wholesale and retail pint sales made up approximately 14 percent of all regular milk sold.

Third-quarts are now served to the trade in some eating establishments in preference to half-pints. The wholesale price of thirds of regular and cultured milk is generally low enough so that the proprietor of a restaurant or other similiar establishment may serve this amount of milk at ten cents and still make a profit.

As one might expect, a large amount of bulk milk was sold to the wholesale trade. Milk ordinarily is cheaper when purchased in this form and for some purposes it is even more convenient for the purchaser to have it in bulk. The greater portion of bulk milk is used in manufacturing and cooking.

TABLE 21.—RETAIL AND WHOLESALE DISTRIBUTION OF REGULAR AND CULTURED MILK IN CHICAGO, ST. LOUIS, AND PEORIA MARKETS

	Chicago 1925-1926		St. Louis 1925		Peoria 1926-1927	
	Retail	Wholesale	Retail	Wholesale	Retail	Wholesale
	<i>perct.</i>	<i>perct.</i>	<i>perct.</i>	<i>perct.</i>	<i>perct.</i>	<i>perct.</i>
Regular milk, sold in:						
Gallons.....	.....	32.36	.....	6.73	.....	16.48
Quarts.....	84.65	45.25	85.90	67.10	85.13	58.99
Thirds.....	.....	.24	.003	.61	.09	2.09
Pints.....	15.06	13.53	14.06	22.17	14.44	13.06
Half-pints.....	.29	8.62	.04	3.39	.34	9.38
Ratio of quart to pint sales.....	100.00	100.00	100.00	100.00	100.00	100.00
Volume (pounds) on which percentages are based.....	5.62:1	3.34:1	6.11:1	3.03:1	5.90:1	4.52:1
Cultured milk, sold in:						
Gallons.....	.....	5.87	.....	1.81	.....	.....
Quarts.....	98.65	89.05	85.75	94.33	89.68	.....
Thirds.....	.27	.37	.40	.40	.....	.....
Pints.....	1.08	1.14	13.73	2.17	10.32	.....
Half-pints.....	.....	3.57	.52	1.29	.....	.....
Volume (pounds) on which percentages are based.....	100.00	100.00	100.00	100.00	100.00	100.00
	14,112,172	4,693,919	1,111,690	2,366,391	5,494,923	144,815

*Cream Sold Mostly in Half-Pints.*—Regardless of the butterfat test within the 20 to 40 percent range, the half-pint is the most popular unit in which cream is distributed to the retail trade (Table 22). In Chicago half-pint retail sales of 22-percent cream were 88.77 percent of the total retail cream sales; in St. Louis they were 44.78 percent, and in Peoria, 67.33 percent. Half-pint wholesale sales of 22-percent cream varied from approximately one-fourth to one-third of total wholesale cream sales. A half-pint of cream generally is sufficient to supply the demand of the average household. Quarter-pints are much in demand in St. Louis. Many households now serve coffee only for breakfast, and a quarter-pint of cream for the coffee is usually sufficient for the average sized family.

Much wholesale cream is sold in bulk to confectioners who manufacture their own ice cream, to large hotels and restaurants, and to drug stores that use a large amount of cream and have facilities to handle it in bulk form. In Chicago bulk cream sales constitute about 50 percent of all wholesale cream sold to the regular trade. Establishments which use only a small amount of cream generally purchase it in quart bottles, since with limited facilities it is more conveniently handled in that form.

*Certified Milk Sold Mostly in Quarts.*—The factors responsible for the popularity of quarts in the sale of regular milk also account for the large percentage of quart sales of certified milk (Table 23). A quart more nearly supplies the average household requirements and generally is less expensive proportionately than are pints. Retail quart sales ranged from 77 percent to 88 percent of the total sales in three markets. Very little of the milk was sold wholesale.

*Cocoa Drinks Sold Mostly in Pints.*—Cocoa drinks are ordinarily used in addition to milk. They are regarded by many as a luxury for children, rather than as a milk substitute, and hence they are sold mostly in the smaller units of measure.

*Cottage Cheese.*—A variety of volumes are employed in dispensing cottage cheese to the trade. In St. Louis the gallon is the standard measure for bulk sales, while in the other two markets the pound is most commonly used. The largest proportion of this product is generally sold in containers with a capacity ranging from ten ounces to one pound.

*Proportion of Liquid Milk Products Marketed in Various Forms.*—The relative distribution of the more important liquid milk products to the retail trade is shown in Table 24 and Fig. 15. Fluid-milk sales constituted approximately three-fourths of total milk sales in the markets of Chicago, St. Louis, and Peoria. Slightly less than one-fourth of all milk sales was sold as cream. The remainder was sold



TABLE 22.—RETAIL AND WHOLESALE DISTRIBUTION OF CREAM IN CHICAGO, ST. LOUIS, AND PEORIA MARKETS  
(Reduced to 3.5-percent milk base)

	Chicago 1925-1926		St. Louis 1925		Peoria 1926-1927	
	Retail	Wholesale	Retail	Wholesale	Retail	Wholesale
	<i>perct.</i>	<i>perct.</i>	<i>perct.</i>	<i>perct.</i>	<i>perct.</i>	<i>perct.</i>
20 to 24-percent cream, sold in:						
Gallons.....	1.78	45.61	.....	11.83	.....	31.11
Quarts.....	.....	12.59	1.21	24.95	3.02	8.50
Pints.....	.03	.33	12.94	1.17	15.52	6.26
Half-pints.....	88.77	24.64	44.78	28.64	67.33	35.16
Quarter-pints.....	.42	.....	21.02	19.89	.....	.....
26-to 32-percent cream, sold in:						
Gallons.....	.....	5.85	.....	1.79	.....	.....
Quarts.....	.03	6.08	.42	6.99	1.18	.....
Pints.....	.01	.36	2.45	.84	1.18	.....
Half-pints.....	8.77	4.52	17.18	3.87	1.67	.....
40-percent cream, sold in:						
Gallons.....	.....	.02	.....	.....	.....	1.43
Quarts.....	.....	.001	.....	.01	.57	4.39
Pints.....	.....	.....	.....	.02	2.01	4.74
Half-pints.....	.19	.....	.....	.....	7.52	8.41
Volume (pounds) on which percentages are based	100.00	100.00	100.00	100.00	100.00	100.00
	268,963,633	145,974,289	14,819,015	5,568,070	1,301,648	867,649

TABLE 23.—RETAIL AND WHOLESAL DISTRIBUTION OF MISCELLANEOUS DAIRY PRODUCTS IN CHICAGO, ST. LOUIS,  
AND PEORIA MARKETS

	Chicago 1925-1926		St. Louis 1925		Peoria <sup>1</sup> 1926-1927
	Retail	Wholesale	Retail	Wholesale	
	<i>perct.</i>	<i>perct.</i>	<i>perct.</i>	<i>perct.</i>	<i>perct.</i>
Certified milk, sold in:					
Quarts.....	80.99	.....	76.86	65.76	88.05
Thirds.....	.86	.....	.....	.....	.....
Pints.....	15.30	.....	23.14	34.24	11.95
Half-pints.....	2.85	.....	.....	.....	.....
	100.00	.....	100.00	100.00	100.00
Volume (pounds) on which percentages are based.....	14,422,543	.....	999,849	47,928	74,473
Cocoa drinks <sup>2</sup> , sold in:					
Gallons.....	.....	.21	.....	.....	.....
Quarts.....	.....	.....	.....	.....	12.53
Pints.....	96.37	99.79	.....	.....	59.37
Half-pints.....	3.63	.....	.....	.....	28.10
	100.00	100.00	.....	.....	100.00
Volume (pounds) on which percentages are based.....	9,018,682	235,650	.....	.....	10,512
Cottage cheese, sold in:					
Gallons.....	.....	.....	1.03	43.30	.....
Quarts.....	.....	.....	.18	1.54	.....
2-pound carton.....	.....	.....	.....	.....	20.89
Pound package.....	.....	.....	37.99	20.72	47.64
Pounds.....	6.68	65.38	.....	.20	31.47
12-ounce package.....	93.32	34.62	.....	.....	.....
10-ounce package.....	.....	.....	60.80	34.24	.....
	100.00	100.00	100.00	100.00	100.00
Volume (pounds) on which percentages are based.....	690,847	125,329	369,893	464,835	18,527

<sup>1</sup>No wholesale figures were available for Peoria. <sup>2</sup>St. Louis milk distributors do not handle cocoa drinks.

TABLE 24.—PERCENTAGE OF TOTAL MILK DISPOSED OF IN RETAIL SALES AS WHOLE MILK, CULTURED MILK, COCOA DRINKS, AND CREAM IN THE CHICAGO, ST. LOUIS, AND PEORIA MARKETS  
(Reduced to 3.5-percent milk base)

	Chicago 1925-1926	St. Louis 1925	Peoria 1926-1927
Milk (excluding certified).....	68.77	74.94	79.61
Cultured milk.....	1.51	1.75	.94
Cocoa drinks.....	.96	.....	.59
Cream.....	28.76	23.31	18.86
	100.00	100.00	100.00
Ratio of milk to cream sales.....	2.39:1	3.21:1	4.22:1
Volume (pounds) on which percentages are based.....	935,380,301	63,578,262	6,902,010

in the form of liquid by-products; namely, cultured milk and cocoa drinks. From an economic standpoint the most significant point in connection with these data is the ratio of milk to cream sales, since cream is generally the more profitable of the two products. Other

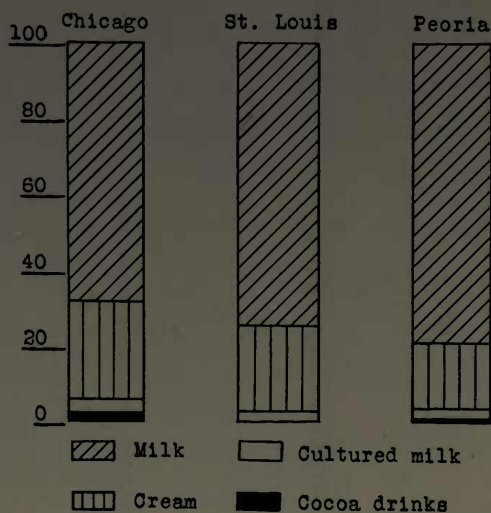


FIG. 15.—PROPORTION OF TOTAL MILK SOLD IN VARIOUS FORMS TO THE RETAIL TRADE IN THE CHICAGO, ST. LOUIS, AND PEORIA MARKETS

The ratio of milk to cream sales was highest in Chicago, 2.39 to 1, and lowest in Peoria, 4.22 to 1. The St. Louis milk distributors did not handle cocoa drinks. See Table 24 for data on which graph is based.

conditions being the same, the larger the portion of the milk supply consumed as cream, the more favorable is the position of the market from the standpoint of the distributor. Chicago, with a ratio of 2.39 units of milk to 1 of cream, has the most favorable position of any of the three markets in this respect. Peoria, with a ratio of 4.22 units of milk to 1 of cream, is in the least favorable position.

Several reasons have been suggested for the variation in the ratio of milk to cream sales in different localities. More than three-fourths of the total cream consumed by the regular fluid-milk trade contains approximately 22 percent butterfat (Table 22). Since this is used chiefly as coffee cream, it apparently would be logical to believe that climate, nationality, and other factors influencing the amount of coffee used would have some effect upon the rate of cream consumption. Price undoubtedly has considerable bearing upon cream sales. As it is possible to use condensed milk in place of cream, relatively high cream prices would be expected to encourage the use of substitutes.

### SURPLUS MILK

The term surplus milk has acquired various meanings as applied to production and distribution. From the standpoint of the dealer, surplus is sometimes thought of as being milk in excess of fluid-milk sales. It is also regarded as milk in excess of the sales of all dairy products processed and manufactured by the dealer for distribution to the fluid-milk trade. The first definition would include sweet cream within the meaning of surplus milk. This would seem illogical since surplus is generally regarded as a burden to the dealer in a flat-price market, and sweet cream is one of the dealer's most profitable products.

In this discussion the term surplus milk, from the standpoint of the distributor, is used to designate all milk in excess of that which is regularly dispensed to the fluid-milk trade in various product forms except that dispensed in the form of butter. Cream, cultured milk, cocoa milk drinks, and cottage cheese are therefore not considered as surplus products but as a regular part of the fluid-milk trade requirements. Butter is included as surplus mainly for two reasons. The returns on butter manufactured from excess milk are generally smaller than those incurred from the sales of the other by-products which are regularly dispensed to the fluid-milk trade; and the average firm does not manufacture butter from excess milk, but does manufacture the other by-products.

Since milk sold for manufacturing purposes yields a much smaller gross return than that sold for fluid consumption, dealers in districts where it is necessary to carry a large surplus, and where a flat price is paid producers for all milk, are at a disadvantage when fluid-milk prices are much above those paid by manufacturers. When milk is

classified and priced in accordance with its uses, as is the case in some districts, surplus generally becomes advantageous to the dealer.

### Causes of Dealer's Surplus

The dealer's surplus may result from the operation of any one or more of several different factors.

*Varying Production.*—Lack of uniformity in production is by far the most important factor in creating surplus milk. As explained on pages 182 and 183, this may be attributed to several different causes. Normally, production is at its height during the months of April, May, and June, and the lowest during the late fall and winter months.

Let us suppose that a particular city requires the total milk supply of ten thousand producers to meet the demands for fluid milk and cream during the season of lowest production. When the surplus season arrives and production per dairy has increased 25 or 30 percent, dealers will be carrying approximately that amount in excess of sales to the regular trade providing they purchase only from farmers. Refusal to take milk from all of the ten thousand dairies would tend to discourage dairying for fluid-milk production.

*Seasonal Fluctuation in Demand.*—Consumption, altho not entirely uniform, is not so irregular as production. The largest variation generally occurs during the months of July and August in our large cities, when city people are away on vacations. The amount of milk consumed monthly for the other seasons of the year usually varies only slightly from the average.

*Irregularity of Daily Demand.*—Daily demand is also irregular. The consumption of certain dairy products may be as much or more for a particular day of the week as it is for the other six days. This is especially true in respect to retail cream sales. National holidays generally increase demand for milk products much above normal daily requirements. Public gatherings, including conventions, special occasions, and other similar events that attract people from other communities, temporarily increase demand in the particular city under consideration. Daily variations in weather conditions generally increase or decrease consumption roughly in proportion to the rise or fall in temperature. Bulletin 269 of this Station, by Ross, presents data which indicate the effect of temperature upon milk consumption.

### Better Transportation Reduces Dealer's Surplus

Dealers' losses from surplus diminish as improvement in milk transportation develops. Ample transportation facilities increase the flexibility of trade in milk and cream. Cities surrounded by good roads often are able to use motor trucks to assist in meeting emergency demands for these products. Main rail lines materially aid cities in



securing incidental shipments of milk and cream on short notice to supplement the regular supply, while markets with poor transportation facilities find it difficult to meet emergency needs by incidental purchases outside of the city. Furthermore, transportation charges are higher when shipping to such markets.

### Problem Varies With Size of Market

Dealers, except the very large ones, in cities large enough to support cream jobbers, have certain advantages in respect to surplus milk that those in smaller cities do not have. Should the demand for fluid milk temporarily increase, these distributors may use part of the milk that is regularly separated for cream sales to meet the increased demand, and replenish the required cream supply by purchasing from cream jobbers. In so doing, dealers are able to operate with a very small surplus.

Distributors located in milk markets of smaller capacity usually must carry considerable surplus milk. Very often these markets are too small to support cream jobbers, and the additional demands resulting from recurrent fluctuations are not large enough to warrant incidental shipments of milk and cream from jobbers in the larger cities. Consequently, emergency needs necessitate the carrying of a surplus. In the small cities not located in intensive dairy sections and where there are some very small dealers, they sometimes, but not often, contract with farmers to take but six days of the total weekly milk production during the surplus season. Such a contract usually can be made only with farmers having but few cows. It is not possible, however, for dealers to use this method of avoiding surplus to any great extent.

### Largest Dealers Carry the Surplus

Large dealers, in districts where there are no regular cream jobbers operating, carry practically all the surplus milk for the market. Even in markets where cream jobbers operate, one or more of the largest dealers generally must carry a surplus owing to the fact that their emergency requirements may be greater than the supply of cream jobbers. The magnitude of the business of large dealers generally enables them to command the required capital for financing the manufacture of surplus milk.

Emergency demands of small dealers ordinarily are not large and may be supplied from any one of several outside sources of milk and cream. Often they rely upon large distributors for their incidental needs. Small amounts of milk and cream are occasionally available at ice-cream factories and condensaries located in the district. Small dealers who carry a surplus are generally at a great disadvantage,

owing to the fact that their surplus output is too small and irregular to command a favorable market outlet.

### Effect of Dealers' Surplus on Producer Prices

There is no escaping the fact that, either directly or indirectly, the amount of surplus milk in a market is reflected in the returns that the producer receives for his milk. In markets offering a flat price for all milk, prices are reduced roughly in proportion to increases in the amount of surplus. In markets where the producer's price is based on the use made of the milk, variations in the amount of surplus cause variations in the pool price.

*Flat-Price Plan.*—Two principal plans for the purchase of milk are followed in the state. The bulk of the milk is purchased on a flat price basis; that is, milk dealers contract to pay one price for all milk for a particular period. At times, however, some modifications are made in this plan. In a few districts, during the surplus season, some of the dealers pay the prevailing milk price for only a definite amount of milk, such amount being based upon producer receipts during one or more previous months of lowest production for the year. Milk in excess of this amount is purchased from the producer at a reduction.

In districts where dealers purchase on a flat-price basis, it behooves them to maintain their surplus at a minimum or else take large losses on such milk should the prices which they are paying producers be much higher than prices paid by manufacturers. Generally speaking, the spread between prices paid producers by fluid-milk dealers in these districts and those paid by manufacturers is inversely proportional to the amount of surplus that must be carried by milk dealers; that is, the spread is large when the surplus is small and small when the surplus is large. Consequently, in markets where the flat-price system is operating and dealers of necessity carry considerable surplus, average prices to producers are nearer than otherwise to the general level of manufacturing prices.

*Price Based on Purpose for Which Milk Is Used.*—A somewhat more satisfactory plan may be carried out in districts where producers and dealers are well organized. Two or more classifications of the milk supply are made according to the purposes for which the milk is to be used. The prices paid producers for milk sold in fluid form are based mainly on consumer prices for such milk, while prices for milk used for manufacturing are in line with the general price level of manufactured milk products. The adoption of such a plan in the Peoria district has encouraged milk dealers to enlarge their manufacturing facilities, and thereby has enlarged the market for milk in that particular dairy section. Producers generally take advantage of

larger market capacity and increase their production even tho increases in surplus will result in lower pool prices.

### Amount of Surplus in Illinois Markets

The amount of surplus milk and the difficulties arising from it have at times been exaggerated in Illinois markets. The various conceptions of the meaning of surplus undoubtedly have been partly responsible. Generally speaking, in flat-price markets conditions of the recent past have enabled dealers to reduce either the amount of surplus milk or the losses generally arising from it, tho there are a few exceptions to this rule.

*Chicago.*—The amount of surplus carried by Chicago distributors is less than it formerly was. Furthermore, there are more dealers than formerly that do not maintain any surplus whatever, and those who do have substantially reduced the amount. As previously mentioned, many distributors now depend upon the cream jobbers for additional requirements.

It is evident from the data in Table 25, which is representative of a large part of the distribution in Chicago, that a material reduction

TABLE 25.—PERCENTAGE OF SURPLUS MILK RESULTING FROM DISTRIBUTION OF APPROXIMATELY ONE-THIRD OF CHICAGO'S MILK SUPPLY<sup>1</sup>, 1921-1927

Year	Percentage surplus based on total purchases
1921.....	7.8
1922.....	6.4
1923.....	6.1
1924.....	7.3
1925.....	3.7
1926.....	1.9
1927.....	3.6

<sup>1</sup>This distribution cannot be taken as representative of the market as a whole, since only the very largest dealers carry a large amount of surplus. In calculating the surplus, all milk and cream purchases were converted to a 3.5-percent butter-fat base.

in the amount of surplus has occurred during the seven-year period beginning with 1921. Surplus milk resulting from approximately one-third of Chicago's total distribution declined from 7.8 percent in 1921 to 1.9 percent in 1926, but rose to 3.6 in 1927. The amount of surplus for 1926 was somewhat lower than normal, owing to restrictions in supply resulting from tuberculin test requirements.

*St. Louis.*—The large distributors in the St. Louis district handle a large volume of surplus milk. Many large milk plants are equipped with machinery for manufacturing surplus milk into various products, including condensed and evaporated milk, ice cream, and butter. This

market is not located in an intensive dairy district, nor is it near other large markets. Consequently there are no large cream jobbers upon whom the distributors can depend for additional purchases.

*Quincy.*—Surplus milk has never appreciably burdened Quincy distributors. Competitive outlets for milk in this district, except the butterfat markets, are minor in comparison with the milk supply of the district. A potential supply much larger than the demand of this fluid-milk market is available at the fluid-milk price practically thruout the entire year. Adequate transportation facilities make it possible for Quincy distributors to command this supply on short notice. This market, like Chicago and St. Louis, purchases on a flat price basis.

*Peoria.*—The Peoria market receives considerable surplus milk. Thru the operation of a milk marketing plan producers are paid manu-

TABLE 26.—MONTHLY VARIATION IN SURPLUS MILK IN PEORIA MARKET<sup>1</sup>  
OCTOBER 1, 1926, TO JANUARY 1, 1928  
(Based on approximately 90 percent of total distribution  
to fluid-milk trade)

Year	Month	Percentage surplus
1926	October.....	23.62
	November.....	23.47
	December.....	22.37
1927	January.....	23.07
	February.....	31.78
	March.....	29.36
	April.....	36.04
	May.....	51.32
	June.....	58.73
	July.....	55.41
	August.....	52.20
	September.....	43.51
	October.....	39.29
	November.....	33.01
	December.....	32.98

<sup>1</sup>Prices paid for surplus milk in this district are based on wholesale butter prices and are less than those paid for the milk used for fluid consumption.

facturer's prices for their surplus. The amount of surplus in the Peoria district has been increasing during the past year (Table 26). The minimum surplus for the year 1927 was 23.07 percent and occurred during January, while in June a maximum of 58.73 percent accumulated.

### Disposal of Surplus Milk

Surplus milk may be converted into a variety of manufactured products. A large portion in most markets is manufactured into

condensed and evaporated milk. Milk, when manufactured in this form, is considerably reduced in volume and greatly enhanced in keeping quality, enabling it to be stored in a small space for long periods of time. Some dealers operate condensing pans in connection with their milk plants; others operate condensaries and evaporating plants in the districts of production.

The amount of surplus milk that is condensed and evaporated by Chicago distributors is much less than formerly (Table 27). These distributors, as a rule, must sell their condensed product at wholesale prices, as their output is too irregular for the development of a favorable retail market. Consequently in flat-price markets dealers often can reduce their losses on surplus milk more effectively by selling the milk direct to condensed-milk manufacturers who have an established retail trade, than by condensing it themselves. Eastern sweet-cream markets now provide an outlet for much of the surplus milk of Chicago.

TABLE 27.—DISPOSAL OF SURPLUS MILK RESULTING FROM DISTRIBUTION OF APPROXIMATELY ONE-THIRD OF CHICAGO'S MILK SUPPLY, 1921-1926

Year	Evaporated	Sold to manufacturers <sup>1</sup>
	<i>perct.</i>	<i>perct.</i>
1921.....	42	58
1922.....	42	58
1923.....	36	64
1924.....	11	89
1925.....	19	81
1926.....	13	87

<sup>1</sup>Milk was sold both in regular form to condensing and evaporating plants and as cream chiefly to ice-cream manufacturers in other cities.

Very few Chicago distributors manufacture any large amount of butter from surplus milk, even tho sales of butter on retail routes are large. The major portion of the butter dispensed thru this sales channel is purchased in the open market.

Unlike Chicago distributors many large distributors in St. Louis, Peoria, and Quincy manufacture much of the butter for the milk route trade. The butter, which is made of sweet cream from whole milk, is of excellent quality and generally commands a premium on the routes. However, unless some profitable disposition is made of the skim milk resulting from the separation of the cream for butter-making, the manufacture of surplus milk into butter generally proves a costly means of disposing of it.

Large milk distributors in down-state sections somewhat generally engage in the manufacture of ice cream and thereby provide a more remunerative outlet for surplus milk than that provided by the usual



sales channels. This surplus outlet is especially well adapted to dealers having a large wholesale milk trade. With such a combination, sales and delivery costs per unit of product may be maintained within very reasonable limits.

### Skim-Milk Disposal

Milk distributors that have a large sweet-cream trade or those that manufacture their surplus milk into butter have large quantities of skim milk to dispose of. In the past much of it was allowed to run into the sewer since it was generally considered difficult to utilize it in a manner that would pay handling charges and yield a profit. Cultured milk and cottage cheese manufacture provide favorable outlets but the demand for these products is relatively small in proportion to the available supply of skim milk. Farmers use skim milk for feeding purposes, but the demand for this purpose does not always command a price that will defray handling charges.

In recent years much of this skim milk has been converted to powdered form, and this seems to be a fairly profitable manner of disposal. The demand for powdered skim milk has been increasing, and the price has been sufficiently high to return the average manufacturer a profit above the total cost of production. Research in animal nutrition has demonstrated beyond doubt its feeding value and thereby increased the demand for it.

Manufacturing of skim-milk powder, however, is applicable only to large-scale production. The original investment, covering installation, machinery, and equipment costs, together with the costs of operation, require large outlays of capital and volume production is necessary for profitable operation. The greater portion of the skim-milk powder made from the surplus of milk distributors is therefore manufactured in dairy districts which support large distributing organizations.

Chicago being a large cream market, it is obvious that dealers would handle a large amount of skim milk. A substantial portion of this is used in the manufacture of skim-milk products. Figures based on an average annual skim-milk production of more than 100 million pounds for the years 1921 to 1926, indicate that more than 50 percent of that used for the manufacture of by-products was converted into powder (Table 28). Less than 5 percent was used for casein manufacture. The amount used in the manufacture of cocoa drinks and soft cheese has been steadily increasing. In 1926 approximately 6 percent of the total output represented in the table was used for making cocoa drinks and about 3 percent for soft cheese manufacture.

During the six-year period farmers purchased large quantities of skim milk from country bottling plants for feeding purposes. Sales

TABLE 28.—YEARLY DISPOSAL OF SKIM MILK IN CHICAGO, 1921-1926

(Figures indicate percentage of total yearly supply and are based on average yearly skim-milk production of more than 100 million pounds)

Disposition and uses	1921	1922	1923	1924	1925	1926
Sold to trade <sup>1</sup> .....	15.49	12.02	15.30	11.57	12.42	14.84
Sold to farmers.....	54.70	54.19	9.88	46.31	32.63	12.74
Cultured milk manufacture.....	10.16	8.50	9.13	7.23	8.30	11.70
Cocoa drink manufacture.....				2.16	3.50	5.85
Soft cheese manufacture.....		.50	1.14	1.24	1.59	3.04
Powdered milk manufacture....	15.85	24.79	54.43	26.21	33.46	36.80
Casein manufacture.....	3.80	.....	3.69	5.28	1.18	.51
Condensed skim-milk manufacture.....	.....	.....	6.43	.....	6.92	14.52
Total.....	100.00	100.00	100.00	100.00	100.00	100.00

<sup>1</sup>Principally to manufacturers.

to farmers, however, declined from 54.7 percent of total skim milk handled in 1921 to 12.74 percent of that carried in 1926. It is expected, that farmer purchases will continue to decline, owing to the fact that dealers are gradually discontinuing the bottling of milk in the country, since tank-car shipments, because of their greater economy, are gradually supplanting case shipments.

Very little, if any, skim milk is sold to the retail trade, as the cost of delivery is out of proportion to its value as a food product. Of the amount that was sold for all purposes in the period covered by this study, manufacturers purchased the greater portion. The average annual amount sold to the trade was approximately 13 percent of the total.

## COSTS AND MARGINS IN MILK DISTRIBUTION

But little information has been available to the public heretofore concerning costs and margins in the business of milk distribution. Marketing agencies as a whole have been reluctant to submit complete sets of cost records for inspection and publication, and furthermore the various systems of keeping records has made the securing and compiling of such information difficult.

The cooperation of a representative number of milk dealers in the four leading markets of Illinois made possible this publication of facts relating to distribution costs. In the compilation of the data many difficulties were encountered, principally on account of the diversity of methods used in keeping financial records, but most of such difficulties have been overcome in so far as practical considerations are concerned.

One obstacle nearly always met when compiling cost records of various organizations is that of varying fiscal years. The records

used in this survey were based upon twelve-month periods beginning as early as November 1 and as late as May 1. The greater part of them, however, began on January 1. Since neither the time nor the necessary data were available to rearrange the costs so as to base them on exactly the same period, the figures in the annual cost tables do not always represent the same identical period tho they do in every case represent twelve months of operation. The fiscal year is given as the calendar year that includes the greater portion of the twelve-month period. From a practical standpoint, the resulting inconsistency would appear insignificant, since no abrupt changes occurred during the period covered by the study in the distribution costs in any of the districts surveyed.

Because of different systems of accounting used by different companies it was necessary to adopt rather general classifications in summarizing expense data. A brief description of these follows:

*Net Sales.*—These consist of the gross receipts from the sale of milk and milk products less discounts and allowances. Wholesale as well as retail sales were included in so far as wholesale sales were made by the dealers whose records were studied. Some of the firms handled bulk milk as a part of the wholesale business.

*Cost of Product.*—Under this head is included the net cost of all milk and milk products that were sold plus milk that was lost in the process of marketing and usually referred to as shrinkage. Records were not always kept by all of the cooperating distributors of the loss of milk that occurred during distribution, but the data that were available for the various districts indicate that this loss was about the same in all and hence similar to that shown for the Chicago district in Table 44 in the Appendix, which averaged about 1 percent of the total milk purchased.

*Gross Margin.*—The gross margin is the difference between net sales and the cost of the product. If an organization is to yield a net profit upon its regular business operations, this gross margin must of course be larger than the total of all expenses.

*Purchasing, Receiving, and Processing Expense.*—This classification is practically self-explanatory. The expense incurred generally began with costs of soliciting milk in the country and terminated after the milk had been processed, bottled, and loaded in wagons or trucks at the loading platform of the pasteurization plant. Some of the dealers, however, who cooperated in this work did not operate country receiving stations. All container costs, including cans, cases, and bottles, were charged under this classification.

*Selling and Delivery Expense.*—Under selling and delivery are included all expenses incurred in advertising and promoting the sale of

milk and in its delivery. It includes rent of barns, garages, and all other buildings such as stores or distributing stations which may be considered necessary to selling, and the maintenance of horses, wagons, motors and any other equipment used in the distribution of the product. The initial stage of delivery began at the loading platform of the pasteurizing plant after the product had been loaded for the milk salesmen. Where distributing branches were operated, the expenses of transporting the product from the pasteurizing plant to the distributing branch, plus unloading, refrigeration, reloading, and other related expenditures, were put in this classification. Wages constituted considerably more than 50 percent of the expenditures in this group.

*General and Administrative Expense.*—The greater portion of the expense in this group included executive and general office salaries. In addition, a few general costs are included which could not be placed elsewhere without complication. Taxes may be given as an example of such an item.

*Net Income.*—This is the portion of the income remaining after all expenses are subtracted, and represents earnings on investment. It is available for dividends to stockholders, expansion of the business, compensation for business risks, as well as for certain types of taxation. In adverse years expenses of some firms were found to be greater than gross margins, which meant that the business during that fiscal year had been operated at a loss.

*Depreciation* is not given a separate heading but was charged against the property used in each of the other classifications.

### Distribution of the Consumer's Dollar

The distribution of the costs involved in the marketing of fluid milk in the Chicago, St. Louis, Peoria, and Quincy areas for different periods during the years 1924 to 1927 are shown in Table 29 and Fig. 16 on a percentage basis. By reading 100 as 100 cents, or \$1.00, and the other figures in the same way, the reader can see what costs and what margin of profit entered into each dollar which the consumer paid for fluid milk.

It is believed that the figures in this table give an accurate picture of the cost of distribution in so far as the records of the companies co-operating in this study are representative of the different markets. It must be emphasized, however, that conditions in the four markets are by no means identical, and any attempt to pass judgment upon the comparative efficiency of their agencies of distribution might prove misleading. At best, only a rough parallelism can be established

TABLE 29.—COSTS AND MARGINS IN MARKETING FLUID MILK IN FOUR MARKETS SUPPLIED BY ILLINOIS PRODUCERS  
(Expressed in percentages of net sales)

	Chicago 1925-1926	St. Louis 1924-1926	Peoria 1924-1926	Quincy 1924-1927
Net sales.....	100.00	100.00	100.00	100.00
Cost of product.....	45.68	51.44	65.87	69.18
Gross margin.....	54.32	48.56	34.13	30.82
Purchasing, receiving, and processing expense.....	15.20	10.77	16.26	12.36
Selling and delivery expense..	32.14	29.92	9.95	12.48
General and administrative expense.....	3.54	2.75	6.18	3.22
Total expense.....	50.88	43.44	32.39	28.06
Net income.....	3.44	5.12	1.74	2.76
Percentage of distribution on which figures are based....	35 to 45	25 to 40	50 to 60	45 to 55

Note.—The major part of the sales in these markets excepting Peoria were retail sales. The wholesale sales included bulk milk sales.

among the markets, and the reader must bear this in mind thruout the discussion.

Not only prices, but ratio of wholesale sales to retail sales, affect total receipts from milk sales. Obviously the total money received from a given quantity of milk will be larger if sold at retail prices than if sold at wholesale prices. The ratio of wholesale to retail sales varied somewhat according to locality. In the Chicago, St. Louis, and Quincy markets wholesale sales are only a small percentage of total sales. In the Peoria market they represent more than 50 percent of the net sales. In this market a large proportion is delivered by independent route owners, and it was therefore impossible to obtain enough data based on retail sales to furnish an accurate basis for comparing the data of this market with the data of the other markets.

*Gross Margin.*—Since the gross margin is the spread between the price the dealer pays for milk and the price at which he sells it, we should expect margins to vary among markets, as prices are not uniform thruout. Producer milk prices, as well as consumer prices, have averaged higher in Chicago than in any of the other three markets. The gross margin in this market must necessarily be large in order to meet the high costs of distribution. In Quincy, where distribution costs have been lowest, the spread is smallest. This particular market is somewhat unique, however, in that its consumer prices have been lower than those in any of the other markets while prices paid producers have compared rather favorably with those of the other markets.



*Total Expense.*—Approximately 51 cents of the consumer's dollar was utilized for total expense of distribution in the Chicago market. In St. Louis about 43 cents was required. In Quincy, the lowest of the four markets, 28 cents was needed; in Peoria, 32 cents. Since

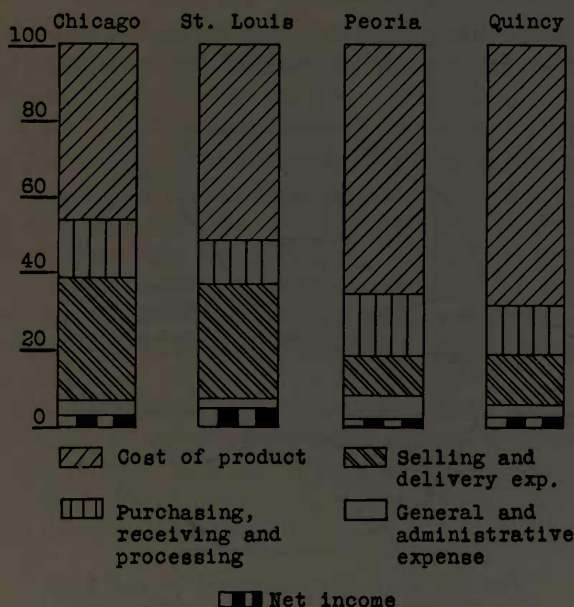


FIG. 16. — COSTS AND MARGINS IN MILK DISTRIBUTION IN FOUR MARKETS

The total length of each bar represents a sales dollar. In Chicago and St. Louis, where marketing costs are higher, the producer received a smaller part of the consumer's dollar than in Peoria and Quincy. See Table 29 for data on which graph is based.

wages make up a large portion of this expense, total expenses were naturally higher, relatively, in the larger markets. Union labor handles the milk supply of both Chicago and St. Louis, but the rate of wages is much higher in Chicago.

*Purchasing, Receiving, and Processing.*—The character of the records made it impossible to break down this classification into three separate accounts. Since some of the dealers whose businesses were studied combine these expenses into one account and others combine some two of them, it was necessary in this study to consolidate them. Purchasing and receiving expenses were naturally higher in the Chicago and St. Louis markets, where country receiving stations were operated.

In Chicago approximately 15 cents of each dollar was used to de-

fray the costs in this classification; in St. Louis 11 cents was used; in Peoria, 16 cents; and in Quincy, 12 cents. In Peoria processing made up a larger proportion of the sales dollar than in the other markets owing to the fact that the sales there were chiefly wholesale and delivery expenses therefore low.

*Selling and Delivery Expense.*—Approximately 32 cents of the consumer's dollar was required to sell and deliver milk in Chicago; in

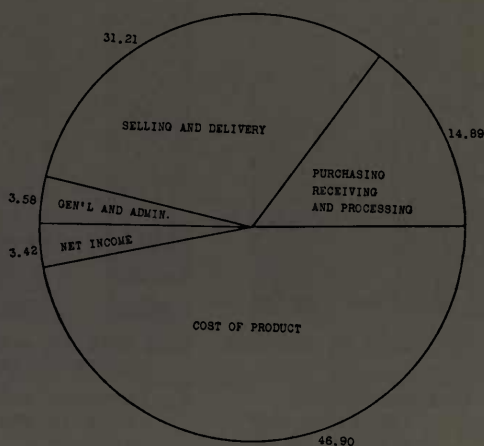


FIG. 17.—AVERAGE DISTRIBUTION OF THE MILK CONSUMER'S DOLLAR IN FOUR ILLINOIS MARKETS, 1925-1926

In these markets approximately 46.9 cents of the consumer's dollar goes to the producer. Distribution expenses have used 49.7 cents, and 3.4 cents has been left as net income to the dealer to cover interest on investment, business risks, etc. (Table 29)

St. Louis 30 cents. In both markets this expense was much higher than the total of all other distribution expenses. The wage rate paid drivers was largely responsible for this fact. In Peoria less than 10 cents on each dollar was required to meet the expense of selling and delivery, while in Quincy about 12½ cents was required. In Peoria and Quincy the dairy employees receive lower wages, and this was reflected in lower selling and delivery costs. Low delivery costs in Peoria, however, may be partly ascribed to the fact that the milk business was largely wholesale.

*General and Administrative Expense.*—These costs made up only a small part of the total expense. With the exception of Peoria, an outlay of less than 4 cents of the consumer's dollar was used for gen-

eral and administrative costs. Since this expense is about the same for either wholesale or retail distribution, it would be highest per sales dollar in the market having the largest wholesale business provided other conditions were the same. Hence this expense, on the basis of the sales dollar, was highest in Peoria, where 6.18 cents was required.

*Net Income.*—The average profit per sales dollar varied from 1.74 cents in the Peoria market to 5.12 cents in St. Louis. In the Chicago market the dealers realized 3.44 cents and in Quincy 2.76 cents. Net losses from a year's business operations were seldom encountered.

*Average Distribution of the Consumer's Dollar in Four Markets.*—The data obtained from the cooperating firms in the four markets are combined in Fig. 17 to show the average distribution of the consumer's dollar. While these data are for large markets, and hence are not truly representative of the cost in small Illinois cities, these markets absorb more than 50 percent of the total milk produced in Illinois for fluid consumption and the data therefore have considerable significance.

The average distribution of the consumer's dollar for all four markets is very similar to that for the Chicago market, as will be noted by comparing Fig. 17 with Table 29. This is to be expected since the distribution on which the Chicago figures are based is much greater than the combined distribution represented in the other three markets.

### Distribution of Consumer's Quart Price

When the total monetary receipts of all milk dealers operating in a market are divided by the total quantity of milk sold, it is found that the average selling price of a quart is considerably less than the retail quart price. This is due to the fact that dealers in fluid milk dispense milk to the trade in different forms, in a variety of units, and at various prices. In the Chicago market the wholesale quart price is 13 cents, which is one cent less than the retail quart price. The price of wholesale gallons, when sold in lots of 5 to 20, generally ranges from 32 to 40 cents, which is at the rate of 8 to 10 cents a quart. Again, a quart of 22-percent cream retails for 64 cents, and approximately 6.3 quarts of milk containing 3.5 percent of butterfat are required to yield a quart of 22-percent cream. Hence each quart of milk sold as 22-percent cream yields a gross return of approximately 10 cents, or 4 cents less than the retail quart price for milk. Even distributors who supply only the retail trade usually fail to realize an average return per quart equal to the retail price of a quart bottle of milk.

The average price per quart for retail milk sales in the Chicago

district for the two years 1925 and 1926 (based on approximately 18 percent of the total distribution) was 12.9 cents, which is 1.1 cent less than the retail price for milk in quarts (Table 30). The total cost of marketing the retail quart was 7.1 cents. Of this amount about 4.6 cents was spent for selling and delivery. After the retail dealer had paid the farmer for his milk and had met the expenses of

TABLE 30.—DISTRIBUTION OF THE CONSUMER'S AVERAGE PURCHASE PRICE FOR RETAIL MILK AND MILK PRODUCTS ON THE BASIS OF A QUART OF 3.5 PERCENT MILK

(Based on total retail sales for all volumes, involving an average distribution of approximately 200 million pounds yearly. At least 95 percent of the sales were retail.)

	<i>cents</i>	<i>cents</i>
Customer's purchase price.....		12.9118
Cost of milk.....		5.3294
Gross margin.....		7.5824
Purchasing, receiving, and processing expense.....	2.1968	
Selling and delivery expense.....	4.5988	
General and administrative expense.....	.3160	
Total expense.....		7.1116
Net income.....		.4708

marketing, he had a net income of approximately one-half cent a quart. Since this study was made, wages for all dairy employees in the Chicago market have been increased \$5 a week. This increase in wages has been offset in some cases by better distribution methods. Many dealers have effected savings by increasing the efficiency of labor in their plants and by combining milk routes.

### Analysis of the Expense Dollar

A detailed analysis of the expenses incurred in the process of distributing milk in the Chicago, St. Louis, Peoria, and Quincy markets is shown in Tables 31 to 35.

By combining certain accounts general expense classifications have been made that render the figures for the different districts fairly comparable (Table 31). The individual detailed accounts of each district (Tables 32 to 35) which make up the general expense classifications usually are not comparable. In one district, for example, the labor account may include wages and commissions, while in another it may refer only to wages. Lack of uniformity in accounting was responsible for this variation among districts. The data in Table 31 are shown graphically in Fig. 18.

TABLE 31.—EXPENSES INCURRED IN MARKETING FLUID MILK IN FOUR MARKETS SUPPLIED BY ILLINOIS PRODUCERS

(Figures indicate percentage of total expenses absorbed by each item)

	Chicago 1925-1926	St. Louis 1924-1926	Peoria 1924-1926	Quincy 1924-1927
Labor, salaries, and commissions.....	65.11	49.49	43.56	50.94
Processing and operating, materials and supplies..	10.81	17.40	12.36	19.04
Taxes.....	.72	.98	.92	1.49
Insurance.....	1.07	2.12	2.84	1.47
Depreciation.....	3.63	8.90	8.43	7.03
Rentals.....	.57	.93	3.74	....
Transportation.....	9.21	4.97	.59	.09
Communication.....	.37	.35	.61	.25
Professional services.....	.15	.56	.77	.44
Unclassified.....	1.75	6.27	8.20	5.61
Advertising.....	1.65	1.74	6.39	3.55
Repairs, maintenance, and construction supplies...	3.97	4.22	8.91	4.97
Operating services.....	.99	2.07	2.68	5.12
Total.....	100.00	100.00	100.00	100.00
Approximate average annual volume (pounds) on which percentages are based.....	40,000,000	40,000,000	10,000,000	6,000,000

*Labor, Salaries, and Commissions.*—A larger share of the expense dollar was used in defraying the combined expense of labor, salaries, and commissions than for any other expense grouping. In Chicago as much as 65 cents in each dollar was used for this purpose. Of this amount the major portion was paid to route salesmen. Each Chicago milk driver, during the period covered by these data, received a minimum wage of \$45 a week plus commissions, the commissions being paid on the basis of sales points.<sup>1</sup> A point was credited to the driver for the sale of a quart or pint of milk or a half-pint of cream, and a half-point was allowed for a third-quart or half-pint of milk (Table 45, Appendix). Six-tenths cent per point was paid to drivers for all points acquired in a week in excess of 1,333. By referring to Table 36 we find that the average retail driver in Chicago during these two years had a weekly total of 2,097 points. Hence on the basis of these figures the average weekly commission was approximately \$4.58. This does not take into account the additional commission on eggs, butter, cheese, and a few other products. For the sale of each dozen of eggs, pound of butter, or package of cheese containing 10 to 16 ounces, the driver received one cent. Six dollars and twenty-five

<sup>1</sup> Beginning May 1, 1927, the minimum wage was increased \$5 a week for all unionized employees in dairies, as mentioned on page 246.



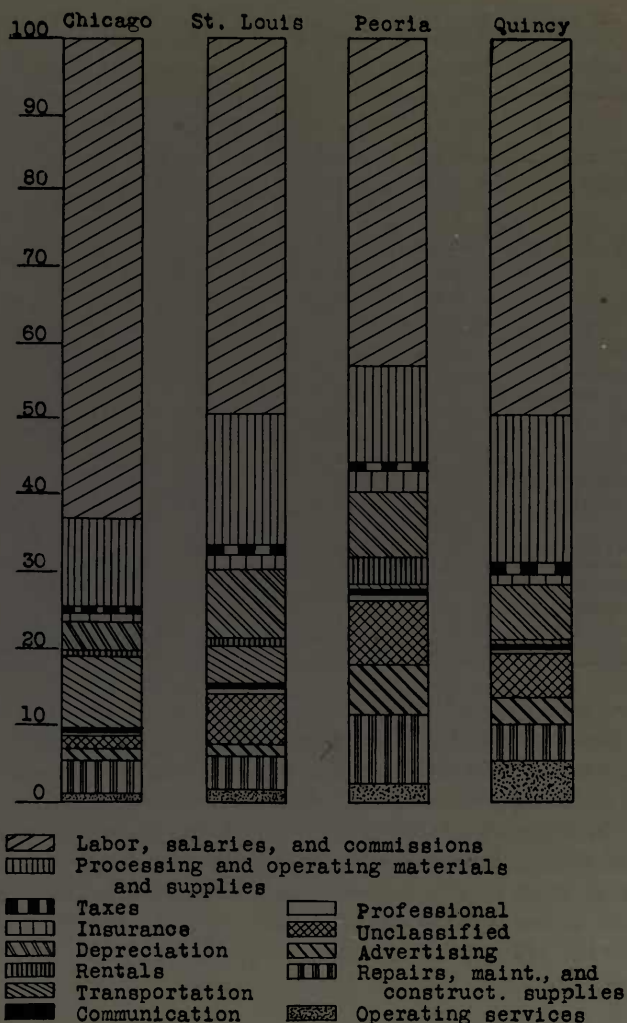


FIG. 18.—ALLOCATION OF DISTRIBUTION EXPENSES  
IN FOUR MARKETS

Amounts spent for labor, salaries, and commissions were smallest in Peoria, where much of the milk is delivered by independent route owners. Table 31 shows figures on which graph is based.

cents has been estimated as the total weekly commission paid for retail delivery. The relief man for the seventh day received a total compensation of about \$9. Hence the wage cost of operating a retail milk wagon for a week of seven days was approximately \$60.

The majority of the wholesale drivers in Chicago did not receive commissions, but were paid salaries of \$48 per week of six days. If to these wholesale and retail driver expenses are added the cost of a two-weeks vacation period for each man and the salaries paid for route supervision and inspection, the expenses per week are increased several more dollars.

In St. Louis the system of payment was somewhat different. The retail drivers received a minimum salary of \$35.75 per week<sup>1</sup> plus commissions. Commissions were calculated on a monthly base, one cent per point being paid retail drivers for all points over 6,250. Relief drivers were paid \$42 a week. Wholesale drivers received one-half cent per point for all points in excess of 12,500 plus a minimum salary of \$37 a week. In comparing the two large markets the reader should not overlook the fact that sales points did not always represent the same sales units in the two localities. The differences are indicated in Table 45 of the Appendix.

The amount paid any other single class of employees was generally less than that paid drivers. Officers' salaries in every instance were only a small percentage of the total expenses of this group.

A fraction less than 50 cents of the expense dollar was used to pay the costs of labor, salaries, and commissions in St. Louis. About the same amount was required in Quincy, while in Peoria this expense was about 6 cents less.

*Processing and Operating, Materials, and Supplies.*—This was the second largest group of expenses, ranging from approximately 11 to 19 cents per expense dollar in the different districts.

Bottle costs were one of the largest items in this classification. In Chicago, St. Louis, and Quincy they made up approximately one-fourth of it (Tables 32, 33, and 35). The expenses for other containers, such as cans and cases, was by no means negligible.

Very few people other than distributors realize the extent of the loss incurred in the use of bottles for distributing milk. Many are broken in the process of handling, while others permanently pass out of the possession of their owners in a variety of ways. Certain large Chicago firms during the year 1926 had to replace their quart bottles that were in daily use about every twenty-five days. Pints had to be replaced in slightly less than half of that time. Cheese jars lasted only about 4 daily delivery trips (Table 46, Appendix). Bottle losses in Chicago, even tho large, are believed to be as small as, or smaller,

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<sup>1</sup> St. Louis drivers, both wholesale and retail, were not put on a six-day week working basis until September 15, 1926. From September 25, 1924, to September 15, 1925, they were allowed a day off every 14th day; from September 15, 1925, to September 15, 1926, they were allowed every 10th day.

TABLE 32.—ALLOCATION OF EXPENSES INCURRED IN FLUID-MILK MARKETING IN CHICAGO, 1925-1926

(Based on average yearly milk distribution of approximately 40 million pounds)

	Percentage	Percentage of total expenses
Labor, salaries, and commissions		
Country.....	1.68	
Motor transportation.....	1.81	
City processing.....	7.91	
General plant.....	3.76	
Platform.....	2.85	
Barn.....	4.13	
Route sales.....	68.64	
General sales.....	5.07	
General administration.....	4.15	
	100.00	65.11
Processing and operating, materials, and supplies		
Supplementary ingredients (chocolate, salt, etc.).....	3.87	
Bottles and bottle caps.....	28.91	
Butter and cheese containers.....	1.87	
Cans, cases, and crates.....	6.09	
Ammonia and coarse salt.....	.19	
Coal.....	11.74	
Gasoline, oils, and grease.....	1.37	
Ice.....	12.09	
Lighting supplies (lanterns, oil, electric bulbs, etc.).....	.72	
Cleaning supplies.....	1.39	
Laboratory supplies.....	.03	
Small tools.....	.05	
Tires.....	.01	
Horse feed, bedding, and miscellaneous.....	26.40	
Stationery and office supplies.....	3.90	
Miscellaneous (milk tags, bottle carriers, etc.).....	1.37	
	100.00	10.81
Taxes.....		.72
Insurance.....		1.07
Depreciation		
Auto trucks.....	5.93	
Horses, wagons, and equipment.....	28.38	
Buildings.....	17.79	
Fixtures.....	4.24	
Machinery and other dairy equipment.....	43.66	
	100.00	3.63
Rentals		
General plant, sales stations, tank cars, barn and stables, etc....		.57
Transportation		
Miscellaneous country and general.....	.59	
Freight and cartage to city.....	79.03	
Trucking—city.....	20.38	
	100.00	9.21

TABLE 32.—ALLOCATION OF EXPENSES INCURRED IN FLUID-MILK MARKETING IN CHICAGO, 1925-1926—*Concluded*

(Based on average yearly milk distribution of approximately 40 million pounds)

	Percentage	Percentage of total expenses
Communication		
Postage, telephone, and wires.....		.37
Professional services		
Collection, legal, accounting, and veterinary.....		.15
Unclassified		
Country and city processing.....	6.70	
Memberships and dues.....	6.70	
Subscriptions and donations.....	6.05	
Property damaged.....	1.72	
Interest paid.....	7.97	
Reserved for bad debts.....	54.45	
Miscellaneous.....	16.41	
	100.00	1.75
Advertising.....		1.65
Repairs, maintenance, and construction supplies		
Buildings.....	5.44	
Machinery and equipment.....	10.36	
Can repairs.....	1.09	
Autos.....	1.32	
Furniture, fixtures, and equipment.....	1.77	
Construction materials, (lumber, pipe, iron and steel, paints, oils, wire, etc.).....	2.33	
Repair parts.....	2.56	
Horses.....	24.41	
Wagons.....	45.32	
Harness.....	5.40	
	100.00	3.97
Operating services		
Light.....	17.62	
Power.....	25.49	
Water.....	19.68	
Hauling.....	4.25	
Messenger.....	3.40	
Towel service.....	4.73	
Miscellaneous (auto service, laboratory, calculating, etc.).....	24.83	
	100.00	.99
Total expenses.....		100.00

relatively, than those in the other districts, owing to the efficient methods of bottle recovery employed in that market.

A large part of the expenses in this classification were for delivery and other transportation costs. Of the other expenditures, fuel and ice were generally the largest in each of the four districts.

TABLE 33.—ALLOCATION OF EXPENSES INCURRED IN FLUID-MILK MARKETING IN ST. LOUIS, 1924-1926

(Based on average yearly milk distribution of approximately 40 million pounds)

	Percentage	Percentage of total expenses
Labor, salaries, and commissions		
Salaries.....	14.65	
Wages and labor.....	77.19	
Commissions.....	8.16	
	100.00	49.49
Processing and operating, materials, and supplies		
Cans and cases.....	9.27	
Manufacturing.....	.56	
Butter and cheese containers.....	3.75	
Bottles and bottle caps.....	24.64	
Refrigerating agents (ammonia, calcium chlorid).....	.73	
Uniforms, including laundry.....	.47	
Fuel.....	6.72	
Ice.....	4.44	
Small tools.....	.09	
Lighting supplies.....	.26	
Miscellaneous supplies and expenses.....	2.48	
Sanitary supplies.....	2.17	
Laboratory supplies.....	.24	
Stationery and office supplies.....	2.59	
Horse feed, bedding, and miscellaneous.....	16.89	
Gas, oil, and grease.....	15.70	
Tires.....	8.55	
Garage and auto supplies.....	.45	
	100.00	17.40
Taxes.....		.98
Insurance.....		2.12
Depreciation		
Buildings.....	1.37	
Office furniture.....	.63	
Machinery and equipment.....	24.44	
Trucks.....	32.92	
Delivery stations.....	40.12	
Water system.....	.52	
	100.00	8.90
Rental.....		.93
Transportation		
Hauling.....	99.52	
Freight and cartage to stations.....	.48	
	100.00	4.97
Communication		
Postage, telephone, and telegraph.....		.35
Professional services		
Legal, auditing, veterinary, collection.....		.56



TABLE 33.—ALLOCATION OF EXPENSES INCURRED IN FLUID-MILK MARKETING IN  
St. Louis, 1924-1926—*Concluded*

(Based on average yearly milk distribution of approximately 40 million pounds)

	Percentage	Percentage of total expenses
Unclassified		
Fees and dues.....	2.51	
Bonuses.....	1.57	
Interest and premiums.....	19.07	
Cash deficit.....	.40	
Loss on property.....	33.62	
Loss on merchandise.....	.37	
Bad debts.....	4.79	
Miscellaneous.....	30.66	
Personal injuries and property damages.....	1.72	
Commercial service.....	1.22	
Subscriptions and donations.....	2.96	
Equipment written off.....	1.11	
	100.00	6.27
Advertising.....		1.74
Repairs, maintenance, and construction supplies		
Buildings.....	3.21	
Repairs on furniture, fixtures, and equipment.....	1.00	
Repairs on machinery and equipment.....	27.95	
Repairs on outside improvements.....	.91	
Repairs on cans and cases.....	2.90	
General supplies and repairs.....	8.77	
Motor repairs.....	43.23	
Harness repairs.....	2.39	
Wagon repairs.....	9.64	
	100.00	4.22
Operating services		
Light and power.....	62.52	
Water.....	17.47	
Towel service.....	1.45	
Laboratory service.....	2.76	
Miscellaneous (testing milk, storage and commission, returned bottle expense, etc.).....	15.80	
	100.00	2.07
Total expenses.....		100.00

*Taxes.*—Licenses are included under this classification. All taxes except those paid on income to the Federal government are a part of this figure. The more important items included in this classification are state franchises and corporate fees, personal and real property and vehicle taxes, and fees for milk licenses. The total outlay for these expenditures was in every district less than 1.5 percent of all expenses.

TABLE 34.—ALLOCATION OF EXPENSES INCURRED IN FLUID-MILK MARKETING  
IN PEORIA, 1924-1926

(Based on average yearly milk distribution of approximately 10 million pounds)

	Percentage	Percentage of total expenses
Labor, salaries, and commissions		
Labor.....	72.06	
Salaries and commissions.....	27.94	
	100.00	43.56
Processing and operating, materials, and supplies		
Fuel.....	10.69	
Ice.....	6.31	
General supplies.....	80.67	
Stationery and office supplies.....	2.33	
	100.00	12.36
Taxes.....		.92
Insurance.....		2.84
Depreciation		
Buildings.....	27.53	
Furniture and fixtures.....	7.62	
Machinery and equipment.....	40.49	
Auto trucks.....	21.46	
Horses and wagons.....	1.87	
Miscellaneous.....	1.03	
	100.00	8.43
Rentals.....		3.74
Transportation		
Freight, drayage, and storage.....		.59
Communication		
Postage, telephone, and telegraph.....		.61
Professional services		
Medical, auditing,*legal, and collection.....		.77
Unclassified		
Loss on stock and property sales.....	7.36	
Loss on bad debts.....	23.58	
Interest paid.....	48.92	
Miscellaneous expense.....	12.71	
Fees and dues.....	4.72	
Donations.....	2.71	
	100.00	8.20
Advertising.....		6.39
Repairs, maintenance, and construction supplies		
Buildings.....	3.64	
Furniture and fixtures.....	.09	
Machinery and equipment.....	16.90	
Autos and wagons.....	64.18	
General supplies and repairs.....	15.19	
	100.00	8.91

TABLE 34.—ALLOCATION OF EXPENSES INCURRED IN FLUID-MILK MARKETING IN PEORIA, 1924-1926—*Concluded*

(Based on average yearly milk distribution of approximately 10 million pounds)

	Percentage	Percentage of total expenses
Operating services		
Light and power.....	49.26	
Water.....	42.22	
Towel service.....	6.06	
Miscellaneous (garbage hauling, scale, boiler and elevator inspection).....	2.46	
	100.00	2.68
Total expenses.....		100.00

*Insurance.*—The disbursements for insurance covered in most cases three types of risk; (1) loss by fire, theft, etc., of real and personal property; (2) loss by death of employer or employee; and (3) loss by accident, either to employees or to any person or property the blame for which could be placed upon the company. Insurance in all four districts was only a small part of total expenses, ranging from 1.07 to 2.84 cents per expense dollar. Better buildings which are less subject to fire and other destructive forces, more efficient use of buildings, materials, and equipment may have been partly responsible for the comparatively low insurance expenditures per unit in the Chicago district; and again some corporations may have borne a larger portion of their own insurance risk than others without charging it especially as an insurance item.

*Depreciation.*—Depreciation costs were variable, ranging from 3.63 cents per dollar of expense to 8.90 cents. The variation may be attributed primarily to the different policies of the several cooperating companies in handling these costs as well as to the type of buildings and equipment. The policies of a business organization in regard to its accounting methods are usually controlled by the head accountant. Since the personal element is thus involved in the estimates upon which depreciation rates are based, considerable variation among companies would naturally be expected.

*Rentals.*—The fact that most milk dealers included in the survey have been established for a long time, and for this reason own most of their buildings and equipment, would in a large measure account for the low rental costs. These were practically negligible in all markets except Peoria, where 3.74 cents of each expense dollar was used. In individual districts, however, conditions may be such as to make it more economical to rent than to purchase outright.

TABLE 35.—ALLOCATION OF EXPENSES INCURRED IN FLUID-MILK MARKETING  
IN QUINCY, 1924-1927

(Based on the average yearly milk distribution of approximately 6 million pounds)

	Percentage	Percentage of total expenses
Labor, salaries, and commissions		
Salaries.....	21.02	
Wages and labor.....	56.57	
Commissions.....	22.41	
	100.00	50.94
Processing and operating, materials, and supplies		
Cans, cases, crates.....	7.54	
Bottles.....	23.07	
General supplies (butter supplies and ingredients, and plant sup- plies, etc.).....	28.66	
Office supplies.....	2.13	
Horse feed and miscellaneous expenses.....	15.73	
Gas and oil.....	9.02	
Fuel.....	13.85	
	100.00	19.04
Taxes.....		1.49
Insurance.....		1.47
Depreciation		
Buildings.....	17.63	
Office furniture and equipment.....	2.69	
Machinery and equipment.....	51.03	
Auto trucks.....	12.07	
Horses, wagons, etc.....	16.58	
	100.00	7.03
Transportation		
Freight and drayage in.....		.09
Communication		
Postage, telephone, and telegraph.....		.25
Professional services		
Auditing and veterinary services.....		.44
Unclassified		
Miscellaneous expenses.....	59.49	
Loss on equipment junked.....	1.64	
Loss on equipment sold.....	14.44	
Interest paid.....	.20	
Bad debts.....	19.30	
Discounts—milk checks.....	.35	
Subscriptions and donations.....	4.58	
	100.00	5.61
Advertising.....		3.55

TABLE 35.—ALLOCATION OF EXPENSES INCURRED IN FLUID-MILK MARKETING  
IN QUINCY, 1924-1927—*Concluded*

(Based on the average yearly milk distribution of approximately 6 million pounds)

	Percentage	Percentage of total expenses
Repairs, maintenance, and construction supplies		
Buildings.....	24.24	
Machinery and equipment.....	30.72	
Cans, crates, cases.....	3.22	
Auto trucks.....	24.80	
Wagons and harness.....	17.02	
	100.00	4.97
Operating services		
Power and light.....	50.72	
Water.....	45.25	
Laundry.....	4.03	
	100.00	5.12
Total expenses.....		100.00

Rental charges for general plant buildings and equipment, sales stations, barns, and transportation equipment, were the principal expenses in the rental group.

*Transportation.*—Expenses grouped under transportation include those paid directly for transportation services, among which were the freight and trucking charges generally incurred in hauling milk from country to city. Costs resulting from the use of carrier equipment owned and maintained by the distributors themselves are placed in other classifications.

The distance intervening between production centers and markets was a factor of much importance in determining transportation costs. In the Chicago district, where the maximum haul was more than 350 miles, these costs were about 10 percent of the total expenses, while in the St. Louis district they were only approximately 5 percent. In the Peoria and Quincy markets, where country stations were not operated and the farmer delivered the milk to the city plant, they were less than 1 percent.

*Communication.*—Under this head are included expenditures for postage, telephone, and telegraph. These ranged from a quarter of a cent to approximately six-tenths of a cent per expense dollar in the four markets.

*Professional Services.*—These expenses were for skilled service such as rendered by veterinarians, accountants, lawyers, collection agents, and other professional men. Like the expenses for communication, they made up a very small part of the expense dollar.



TABLE 36.—SEASONAL VARIATION IN WEEKLY POINT<sup>1</sup> SALES PER ROUTE IN CHICAGO AND ST. LOUIS MARKETS<sup>2</sup>

	Chicago, 1925-1926		St. Louis, 1923-1925			
	Retail		Retail		Wholesale	
	<i>points</i>	<i>perct.</i>	<i>points</i>	<i>perct.</i>	<i>points</i>	<i>perct.</i>
January.....	2 092.25	99.79	2 398.66	102.68	5 245.33	92.24
February.....	2 120.88	101.15	2 429.00	103.97	5 443.66	95.73
March.....	2 142.00	102.16	2 371.00	101.49	5 714.33	100.48
April.....	2 144.00	102.25	2 396.33	102.58	5 642.00	99.21
May.....	2 132.73	101.72	2 328.66	99.68	5 803.00	102.04
June.....	2 125.05	101.35	2 277.33	97.48	6 141.33	107.99
July.....	2 042.25	97.40	2 184.00	93.49	6 101.66	107.30
August.....	2 050.80	97.81	2 194.00	93.92	6 041.00	106.23
September.....	2 126.25	101.41	2 275.00	97.38	5 775.00	101.55
October.....	2 083.13	99.35	2 363.66	101.18	5 646.66	99.30
November.....	2 064.80	98.48	2 433.66	104.17	5 443.66	95.73
December.....	2 036.50	97.13	2 382.33	101.98	5 243.00	92.20
Weekly average	2 096.72	100.00	2 336.14	100.00	5 686.72	100.00
Approximate average annual volume on which data are based	186,000,000 pounds		63,000,000 pounds		32,000,000 pounds	

<sup>1</sup>See Table 45, Appendix, for allocation of points. <sup>2</sup>The sales included all dairy products disposed of to the regular trade.

*Unclassified.*—The unclassified expenses exhibit considerable variation in amount according to the particular market. In Chicago they were less than 2 cents per dollar. The range in the other three markets was from 5.61 cents to 8.20 cents. These variations are largely due to differences in the items placed here. There is much difference of opinion among accountants regarding the exact category to which some expenditures belong. Some accountants, for example, charge bad debts to sales, while others make no attempt to classify this account definitely but place it in the unclassified group. The failure to adopt a uniform system of accounting renders exact comparability impossible.

*Advertising.*—The amount spent for advertising in the two larger markets, Chicago and St. Louis, was less than 2 percent of all expenditures. Costs in Quincy were proportionately about twice as large (3.55 percent) and in Peoria more than three times as large (6.39 percent). This appears to be quite natural when it is considered that there are more distributors in the larger cities by whom this expense may be shared, and also that more people can be reached per dollar spent where population is more dense. The importance of advertising, from the standpoint of the farmer, is apparent when it is considered that the rate of milk consumption per capita, as well

as population, determines the capacity of the farmer's market for milk. Dairy men in some localities have begun to realize the beneficial effect of advertising upon the expansion of their markets, and where organized are using some of their own funds for this purpose.

*Repairs, Maintenance, and Construction Supplies.*—The outlay for this classification was rather uniform in three of the four markets. With the exception of Peoria, approximately 4 to 5 cents in each dollar was spent for these purposes. In Peoria the expenditure was about twice as great (8.91 percent). The major portion in all markets was spent for the maintenance of transportation and of plant equipment and machinery. Only a small part of the total was, as a rule, spent for construction supplies and for the upkeep of buildings.

*Operating Services.*—The total cost of such service as heat, light, power, and water for commercial purposes depends principally upon the degree of efficiency exercised in their use and the rates charged for them. In Chicago these expenses constituted about 1 cent of the expense dollar and in Quincy about 5 cents. The other two markets ranged from 2.07 to 2.68 cents. Rates generally vary with locality. Usually rates for power are higher in the small cities. Furthermore, in the smaller municipalities, where the volume of business is generally much less than in the larger markets, it is impossible to use such services as efficiently as in the larger markets. In some localities firms consider it more economical to supply their own service in one or more of these lines. There are organizations, for example, that drill and operate their own water wells, and produce the required electrical power with their own generators.

### Profit and Loss on Various Sales Units

So far the discussion has been based upon the operation of the business as a whole and scarcely anything has been said concerning the costs and margins of the different dairy products and sales units. Unless dealers' and producers' organizations know which products and sales units are the more profitable, they cannot develop their markets so as to yield maximum returns. A study of this phase of the milk distribution business was made in the Chicago market. The data are based on operations during 1924 and cover a retail distribution of approximately 150 to 200 million pounds of milk (Table 37). The major portion of the cream supply included in this distribution was purchased from cream jobbers, and hence only a very small amount of surplus was carried. Returns on the different products and sales units depend not only on the prices received but also on the volume handled and the efficiency of the dealer as well.

TABLE 37.—UNIT PROFITS AND LOSSES ON RETAIL MILK AND CREAM PRODUCTS IN CHICAGO MARKET, 1924

(The milk and cream included are a part of a total distribution of approximately 150 million pounds of milk; by-products, 200 million pounds.)

Products	Unit profit or loss <sup>1</sup>	Equivalent per quart of 3.5-percent milk
<i>cents</i>		
Whole milk		
Quarts.....	.752	.752
Pints.....	-1.560	-3.120
Half-pints.....	-.936	-3.744
Sweet cream, 22 percent		
Half-pints.....	1.730	
Half-pints, on 3.5 percent milk base <sup>2</sup> .....	.275	1.100
Sweet cream, 32 percent		
Half-pints.....	2.060	
Half-pints, on 3.5 percent milk base.....	.225	.900
Cocoa drinks		
Pints.....	.893	
Cultured skim milk		
Quarts.....	.643	
Cottage cheese		
Three-quarter pound cartons.....	.887	

<sup>1</sup>Losses are represented with a minus sign before the figures.<sup>2</sup>It requires 6.286 quarts of 3.5 percent milk to make one quart of 22-percent cream. Since one half-pint of this cream yielded a profit of 1.730 cents, four half-pints yielded a profit of 6.92 cents. Hence,  $\frac{6.92}{6.286}$  equals 1.10 cents, which was the profit per quart of 3.5-percent milk when sold as cream in half-pints at the retail price. Similarly 9.143 volumes of 3.5-percent milk are required to make a corresponding volume of 32-percent cream.

*Whole Milk.*—Of the volumes listed in the table, quart sales of milk were the only whole-milk sales returning a profit; for each quart sold to the retail trade there was a net margin of .752 cents. Pints were sold at a loss of 1.56 cents each; which, on a quart basis, would be 3.12 cents. This loss occurred in spite of the fact that pints sold for 8 cents, which was 1 cent more than half the quart price. The fact that the cost of handling pints was practically equal to that required for handling quarts was largely responsible for losses on pints. As shown by Table 46 in the Appendix, the number of pint bottles lost was twice as great, relatively, as quarts. Furthermore, a pint bottle costs only slightly less than a quart. Again, the costs of processing, selling, and delivery, and administration were about the same for pint as for quart volumes. When we consider that it cost the retail distributor between 7 and 8 cents to handle a quart of milk

TABLE 38.—COMPARISON OF AVERAGE PRICES PAID PRODUCERS FOR FLUID MILK IN FOUR MARKETS, 1923-1927, AND PRICES PAID BY DAIRY MANUFACTURERS (Chicago monthly fluid-milk prices f.o.b. country station are taken as 100, all other prices are expressed as percentages of these.<sup>1</sup> All based on 3.5-percent milk)

Month	St. Louis fluid-milk prices f.o.b. country station	Peoria fluid-milk prices f.o.b. city <sup>2</sup>	Quincy fluid-milk prices <sup>3</sup> f.o.b. city	Condensary prices <sup>4</sup> f.o.b. condensary	Hypothetical returns to cream producers <sup>5</sup>
January.....	91.7	94.4	104.4	86.9	77.4
February.....	91.7	93.7	103.2	85.7	77.4
March.....	87.2	93.6	104.0	84.4	78.4
April.....	80.5	89.2	99.6	81.3	70.5
May.....	71.7	86.5	105.5	79.3	70.0
June.....	73.5	85.0	106.8	78.2	71.3
July.....	73.8	79.3	97.7	72.7	64.8
August.....	75.0	80.0	96.2	73.8	65.4
September.....	76.9	81.5	99.2	75.4	70.0
October.....	82.4	85.1	102.0	78.8	74.1
November.....	87.4	88.2	104.3	80.7	79.5
December.....	90.1	92.5	104.7	84.2	81.8

<sup>1</sup>For actual prices see Tables 49 to 52 in Appendix. <sup>2</sup>The reader must not overlook the fact that the prices paid for milk in the Peoria, Quincy, and condensary districts are f.o.b. city, while those paid in Chicago and St. Louis are f.o.b. country station. <sup>3</sup>From 1924 to 1927 only. <sup>4</sup>Prices were obtained from market reports of the Bureau of Agricultural Economics, U.S. Department of Agriculture, and are based upon the average prices paid producers in the eastern section of the Northern-Central states. <sup>5</sup>These percentages were based upon hypothetical returns to producers for cream used for butter manufacture, which returns were calculated by multiplying the average Chicago monthly prices of butter extras plus 20 percent by 3.5, the latter figure being the number of pounds of butterfat in 100 pounds of 3.5-percent milk.

and only slightly less to handle pints, we realize why pints were sold at a loss of 1.56 cents.

It must not be inferred, however, that individual milk dealers would profit by sacrificing their pint customers and thereby abandoning that part of their business entirely. The sale of pints increases the volume of business and thus lowers overhead expenses. It absorbs a part of the expenses that would have to be borne by quarts. Hence the elimination of pint sales would result in a smaller net profit on the sale of quarts. Were it not for the fact, however, that the discontinuance of pint sales altogether might cause a decline in the per capita consumption of milk, dealers would profit materially by such a change.

*Cream.*—As already stated, in most markets cream is one of the most profitable milk products the dealer sells to the regular trade. In the Chicago market during the period studied, for each quart of 3.5-percent milk sold as 22-percent cream in half-pint bottles, a net profit of 1.1 cents was realized, which is considerably more than that realized from the sale of a quart of fluid milk. The profit from

32-percent cream was .9 of a cent. The cream upon which these margins were figured was bought from jobbers at a price equivalent to approximately 85 percent of the price paid for cream in the form of fluid-milk. If these dealers had obtained this cream from milk purchased at the current fluid-milk prices paid producers in the Chicago district during 1924, the margin of the 22-percent cream would have been reduced by about 85 hundredths of a cent a quart of milk plus the extra expenses of separating.

*By-Products.*—Prices realized for by-products in the Chicago market in 1924 were high enough to yield the average dealer a fair return provided his volume was not too small. It is more or less essential that all dealers supply their trade with these, since certain consumers confine their milk and cream purchases to dealers who handle them.

Information such as the foregoing indicates to dealers the kinds of products which it would be to their advantage to push by advertising or otherwise. It is of value to dairy councils, producer organizations, and other agencies interested in increasing the sale of milk, since the prices that different markets can pay for milk are influenced by the sales ratios among the various profitable or unprofitable sales units. The data given in Tables 21 and 24, showing the ratios of pints to quarts and milk to cream in the four markets covered in this study, are of special interest in this connection.

### Outlook for Distribution Costs

Up to this point the discussion has been based on data for various periods extending in some cases to as recent a time as the mid-part of 1928. Many important facts about the milk business have been brought, in a general way, to the reader's attention. Production areas, as well as the markets have been analyzed. The agencies and instrumentalities of distribution have been discussed. Trends in consumption have been determined, whenever sufficient data were available, which should give at least a general idea of what may be expected in the future. Conditions, however, do not remain static, but new developments and additional improvements continue to appear. Absolute predictions as to the future are therefore impossible, altho a study of the past reveals certain facts of value when planning for the future.

Since 1927, the last year for which financial data are presented, distribution costs as a whole have been increasing. Two factors are mainly responsible for this situation: a demand by the public for a safer and better milk supply and increases in the wage rate. More stringent health regulations have either been passed or are contem-



plated for the near future. A new ordinance became effective in St. Louis in April of this year (1928), requiring a product of higher quality and thereby necessitating additional expense for distribution. Peoria likewise has passed such an ordinance. On May 1, 1927, as previously stated, wages in the Chicago district were increased \$5 a week for all unionized employees in milk establishments. As the margin between producer and consumer prices in this market remained practically the same in 1927 as it was in the two previous years, profits must have been reduced unless dealers were able to balance the increased expense by more efficient marketing. (Dealers' margins for the years 1908 to 1927 inclusive are shown in Table 47 of the Appendix.)

There are a few factors, on the other hand, that tend to reduce present distribution costs, tho they do not amount to much in the aggregate. The more extensive use of tank cars has enabled dealers to ship milk at lower rates, but this is small as compared with the increases in other distribution costs that have taken place, for the total cost of transportation has never made up a large part of the total distribution costs.

The fact that increases in the cost of distribution have not always been met with proportionate increases in the dealers' margins has made it difficult for dealers with only a small volume of business to survive. Hence bankruptcies and mergers have been rather frequent, and the result has been that greater volume per dealer has slightly reduced overhead costs.

With the increasing insistence upon a product of better quality and with no apparent evidence of a reduction in dairy wages, there appears to be scarcely any possibility of a reduction in distribution costs within the near future unless duplication in marketing can be substantially reduced, making possible a larger volume of distribution per unit of marketing machinery, or unless entirely new systems of distribution are evolved.

### FACTORS AFFECTING DEALERS' MARGINS

Marketing costs vary with different markets. To account for the variations between markets, it is necessary to become familiar with the factors that influence them. One approximate measure of marketing costs often used is the margin between the price paid the producer for a quart of milk and the retail price paid by the consumer. This difference is often termed the dealer's margin. In Chicago from 1922 to 1927 this margin averaged between 8 and 8.8 cents on a yearly basis (Table 47, Appendix).

A much more accurate measure of total distribution costs would be the gross margin between the cost of all milk purchased in a market

and total receipts from its sale. Such data, however, are not readily available and the less accurate measure is generally employed. Regardless of its inaccuracy, however, it may be of practical value when making approximate comparisons provided it is used with discretion. One error especially that must be avoided when comparing districts is the use of station milk prices to calculate the margin in one district and city prices in another, for the difference between these two prices is usually large enough to render such a comparison very misleading.

Following is a discussion of some of the more important factors affecting dealers' margins.

### Intensity of Dairying

Differences in the degree of intensity in dairy production in the various districts has already been noted. In the territory supplying Chicago, approximately 35,000 gallons or more of milk is produced annually per square mile, while in the Peoria district the production per square mile is only approximately 6,000 gallons (Fig. 3). The average daily production of milk per dairy was approximately 290 pounds in the Chicago district and only 112 pounds in the St. Louis district (Table 4). Under such conditions receiving stations in the St. Louis section would normally handle a smaller volume and hence station overhead charge would be higher. From the standpoint of these and other related considerations purchasing costs would therefore be much greater in the less intense dairy district.

Another important advantage in an intense dairy district is its adaptability to the use of the tank car. Since the tank car has a rated capacity of 50,000 pounds, little if any economy could be effected by its use in other than intense production sections. The tank-car rates for a minimum of 40,000 pounds over distances of 25 to 275 miles ranged from 52.3 percent to 70 percent of the less-than-carlot rate for 10-gallon cans of milk for the same distance (Table 7).

### Transportation Advantages

Surfaced roads and rail facilities are the more important transportation advantages affecting dealers' margins. Illinois' system of paved roads makes it practical for a large portion of the milk supply produced within a radius of 75 miles of the markets to be trucked. As these roads are rather uniformly distributed thruout the state, differences in trucking cost among different markets on a mileage basis are small.

In most large markets the bulk of the milk produced beyond a radius of 75 miles is transported by rail. Altho rail facilities are very good for the state as a whole, some markets, owing to location and larger capacity, have greater advantages than others.

Disregarding the manner in which milk is transported to market, we may say that costs increase roughly in proportion to increases in distances to market. It is evident that it will cost relatively more to transport milk to market in the Chicago district, in which the maximum haul is 361 miles, than in the Peoria and Quincy sections, where the maximum hauling distance is approximately 50 miles. Furthermore, when dairy sections are located great distances from markets, the necessity of operating country receiving stations adds to the expense.

The geographical location of certain markets forces them to extend their operations much farther than the average market of similar capacity. Chicago, with Lake Michigan as its eastern boundary, is illustrative of such a market.

### Butterfat Content of Milk

The amount of butterfat in milk has a decided influence upon dealers' margins. As shown in Fig. 7, the cost per unit of butterfat decreases as the test increases. For example, if the base fluid-milk price is \$2.50 per hundredweight with a 4-cent differential operating above or below a 3.5-percent butterfat standard, 100 pounds of milk containing 3 percent of butterfat would have a value of \$2.30, a rate of 76.67 cents for each pound of butterfat contained therein. The same amount of milk with a 4-percent butterfat content would be valued at \$2.70, a rate of 67.5 cents per pound of butterfat. One hundred pounds of 32-percent cream, when separated from the 3-percent milk purchased at the above price, would cost the dealer \$24.53 minus the value of the skim milk. An equal amount of cream when separated from the 4-percent milk would cost \$21.60 minus the sales value of the skim milk. In the first case there would be 967 pounds of skim milk; in the latter 700 pounds, a difference of 267 pounds. Should the dealer sell the skim milk at 20 cents per hundredweight, he would receive 53 cents more for the skim milk from the 3-percent milk than from the 4-percent milk. The difference between the cost of the cream from the two sources, irrespective of the skim-milk value, is \$2.93. This amount minus the difference in the estimated value of the skim milk (53 cents), equals \$2.40, which is undoubtedly a substantial saving to realize on 100 pounds of 32-percent sweet cream. As the milk tests higher, the saving becomes greater. Five-percent milk compared with 3-percent milk yields a saving of \$3.84 on 100 pounds of 32-percent cream.

Not only is milk that is high in butterfat more economical as a source of sweet cream for the trade, but it is evident that it is also more economical as a source of whole milk provided standardization of milk is permitted in the market. It is obvious from the above that

distributors, in markets where the milk produced has a low butterfat content, require a relatively larger margin. The Quincy district produced milk with the highest percentage of butterfat, ranging during the year 1925 from 3.61 percent to 4.06 percent. In the Chicago district, where the butterfat content is lowest, the range during 1926 was between 3.43 percent and 3.68 percent. (Table 5)

The foregoing discussion has to do with the butterfat content of the milk as purchased from the dairy farm. The percentage of butterfat in the milk that is delivered to the trade is also of economic importance. Since butterfat is the most expensive portion of milk, it is clear that larger margins are required in markets which distribute milk with the higher percentage of butterfat, provided all other conditions are relatively the same, than in those distributing milk of low butterfat content. About the only basis we have for comparing the butterfat content of the milk as delivered in the different markets is the butterfat content most generally prevailing. In Chicago during the past year, it has been estimated as having been approximately 3.5 percent; in Peoria, 3.7 percent; and in St. Louis, 3.8 percent. These figures may, however, change at any time.

### Surplus Milk

The volume of surplus milk which a dealer must carry necessarily influences the margin he must allow for expenses.

Generally speaking, in districts where flat prices are paid for all milk, losses on the principal surplus products, such as condensed and evaporated milk and butter, generally must be borne by dealers unless fluid-milk prices are practically as low as prices paid by established dairy manufacturers. Profits on the milk sold to the regular trade must be depended upon to absorb the losses. When, however, fluid-milk prices are reduced to the level of manufacturing prices, the fluid-milk producer can well afford to shift to dairy manufacturing markets, since the cost of producing milk for manufacturing purposes is generally less than producing it for fluid consumption. Such a price reduction would therefore result in an insufficient supply of milk for fluid consumption, and it is mainly for this reason that fluid-milk prices paid producers are generally somewhat higher than those paid by manufacturers. (For comparison of milk prices paid by milk dealers and manufacturers, see Tables 38, 40, 49, 50, 51, and 52.)

In markets which have a price plan and which pool their milk, the pool price becomes higher or lower with decreases or increases in surplus, owing to the fact that the surplus is purchased at manufacturing prices.

### Standard of Milk Quality

The serious consequences which result from dipping milk from the can of the distributor to the pail of the consumer and from the consumption of raw milk produced under ordinary circumstances are now generally recognized. This is one of the reasons why pasteurizing and bottling of milk are practiced to a greater or less extent in all the larger markets. Precautionary methods, however, which influence sanitation and efficiency in pasteurization, vary and consequently there are differences in processing costs among markets.

Public demands as enforced thru regulatory measures of municipal health departments differ with locality. The maximum bacterial count permitted in the milk supply of markets is not uniform, and neither are temperature regulations uniform. In general the larger the market the stricter the regulations.

Altho improvement in milk quality tends to force an enlargement of the dealer's gross margin, still producers and distributors are eventually amply repaid by the greater sales which result from increased per capita consumption.

### Proportion of Different Units Sold

Not all volumes nor all milk products are sold on a uniform profit basis. As indicated in Table 37, there is considerable variation in the net profits from the various units in which milk and its products are sold. Since more than 50 percent of the dealer's milk supply is sold as milk, the greater portion of which is dispensed to the trade in quarts and pints, the difference in profits between pint and quart sales is a very important factor in determining what the margin must be in any particular district.

Of equal or even greater importance is the ratio of milk to cream sales, if the margins are as found in the Chicago market. The variations among markets in volume and product sales have been discussed on pages 225, 230, and 231.

### Wages

The effect of wages upon distribution costs has been previously discussed, and their influence upon margins is so evident that it hardly warrants any further elucidation. The rate of wage paid for dairy labor varies according to the district, irrespective of whether labor is organized or unorganized. In the unorganized districts local supply and demand and custom determine the wage rate for the district. In the unionized markets the rate apparently depends not so much upon supply and demand as it does upon the strength of the local union organization and the amount of support given its policies by the public. Altho both the St. Louis and Chicago markets employ union



labor, wages in Chicago are substantially higher than in St. Louis. As mentioned previously, retail milk drivers in Chicago receive a salary of \$50 a week plus commissions, while in St. Louis they receive \$35.75 plus commissions. The proportion which wages constitute of total distribution costs in various markets has been discussed on pages 247 to 249 and shown in Tables 31 to 35.

### Efficiency and Net Profit of the Dealer

The efficiency of the milk dealer and the net profit retained by him are largely determined by the intensity of competition in the business. In most markets, as competition has become more intense a higher degree of efficiency has been developed and the general level of profits has been lowered. The inability of the inefficient distributor to confine his expenses within the limits of the margin of the district has left the field in control of the more efficient, thus increasing the volume of business per dealer and reducing overhead costs. Local conditions result in varying degrees of efficiency in the different markets, and this is reflected in the margins. Net profits are also reflected in the margin; in the four markets under discussion these varied from 1.74 to 5.12 percent of the net sales.

### Miscellaneous

Among miscellaneous factors those that appear to be the most outstanding are investment, per capita consumption, and service, including also the delivery and housing system, all of which differ among markets and hence are partly responsible for variations in margins between markets.

Investments essential to the operation of milk distributing establishments, as would be expected, are higher in the larger cities for reasons that are generally well known. With respect to per capita consumption it may be said that other things being equal, the higher it is the lower the margin that can be accepted, as higher per capita consumption means not only a larger volume per market but also that a relatively smaller number of pints will need to be delivered. With respect to service, delivery, and the prevailing housing system, it is obvious that if a greater portion of the population is housed in large apartment buildings, fewer stops will have to be made by the delivery man.

## SUMMARY AND CONCLUSIONS

Milk marketing in Illinois has undergone some very material changes during the past two decades. The boundaries of production districts have been extended farther and farther from the larger centers of consumption. Improvements in transportation have lessened the perishability of milk in shipment and have relatively reduced transportation costs. This expansion in area has increased the competition of producers located close to the consuming markets.

The quality of milk has generally improved, in response to consumer preference. At least 70 percent of the fluid milk now distributed in most of the larger markets of Illinois is pasteurized; most of our larger cities have adopted ordinances which make pasteurization compulsory and require that milk come from herds free from tuberculosis. Municipal health bureaus have been established to enforce these provisions and others aiming at a better and safer milk supply.

Costs of distributing milk have increased, and hence the margin between prices paid producers and those paid by consumers has increased. These higher costs reflect a higher wage level, as well as increased complexity in the milk marketing, improvement in milk quality, and expansion of the dairy production districts.

This survey was undertaken primarily as a study of dealers' costs and margins in the four large markets for which Illinois dairymen produce milk. The study extended over 1925 and 1926 in Chicago, 1924 to 1926 in St. Louis and Peoria, and 1924 to 1927 in Quincy. Data concerning production and consumption are also included to give a representative picture of the general field of fluid-milk distribution.

*Milk Production.* The northern part of Illinois is the only section of the state where dairying is extensively carried on as a major type of farming. Here milk production per farm is almost twice as great as that in any other Illinois dairy district. During the season of lowest production about 35,000 farms produce for the Chicago market. Approximately 40 percent of the total supply comes from Illinois farms. The remainder comes from Wisconsin, Indiana, Iowa, Michigan, Ohio, and Minnesota. Production data for the Chicago dairy district based upon from 1,455 to 3,855 farms beginning with 1912 show a rather slow increase in the rate of production per farm in this district.

Illinois producers supply about 80 percent of the total amount of milk consumed in the St. Louis market. The other 20 percent is produced in Missouri. In the Quincy district approximately 90 percent is supplied by Illinois dairymen, and the other 10 percent by Missouri dairymen.

Production was largest in the spring months in each of the four districts surveyed. The greatest irregularity in seasonal production of milk occurred in the St. Louis district, where monthly receipts at dealers' plants ranged from 62.3 percent to 149 percent of the average month during the period.

The butterfat content of the milk was highest in the St. Louis and Quincy sections. In the St. Louis district the monthly average ranged from a maximum of 4.1 percent to a minimum of 3.5 percent; in Quincy, the maximum was 4.06 percent and the minimum 3.61 percent. The Chicago range was from 3.43 to 3.68 percent and the Peoria from 3.45 to 3.93 percent.

*Transportation.* Practically all of the milk supply of St. Louis, Peoria, and Quincy is trucked to market. Only 37 percent is trucked to the Chicago market; of the remainder, which is hauled by rail, 55.5 percent is transported by tank cars. The tank car has played a large part in bringing about the extension of the Chicago dairy district that has occurred the last five years. At the present time milk is hauled from one production district located approximately 360 miles from the Chicago market. Tank car rates from 27 shipping stations to Chicago ranged from 52.3 percent to 70 percent of the 10-gallon can rate for less than earlots.

*Milk Consumption.* The daily per capita consumption of fluid milk in Chicago in 1927 was .801 pint; in St. Louis, .666 pint; in Peoria the daily per capita consumption of fluid milk and cream combined was .681 pint.

With the exception of St. Louis, milk sales as a whole were lowest during July and August in all four markets. In Chicago sales during each of these two months were about 3 percent below the average month. In Peoria and Quincy, July sales were less than 4 percent below the average month, while August sales were approximately 6½ percent below. In St. Louis, December and January were the low months.

Cream sales were somewhat more irregular than milk sales. July, August, and September, were the months of lowest sales. The greatest irregularity occurred in the St. Louis market, where sales for different months ranged from 78.4 percent to 111.8 percent of the average.

There was considerable variation in milk sales between days of the week. Maximum and minimum quart sales in Chicago, expressed in percentages of average daily sales, were 117.6 percent on Monday, 96.1 percent on Saturday; in St. Louis, 107.9 percent on Saturday, 87.5 percent on Sunday; in Peoria, 103.5 percent on Saturday, 98.0 percent on Tuesday; in Quincy, 107.9 percent on Tuesday, and 87.8 percent on Sunday.

Sunday sales of 32-percent cream in the Chicago and St. Louis markets were approximately 2½ times average daily sales; in Peoria

they were approximately 3.7 times the average; while in Quincy they were about  $13\frac{1}{4}$  times average sales. Altho Sunday sales of 22-percent cream were largest in all the markets except Quincy, they were not over  $11\frac{1}{3}$  times the average sales. Quincy sales were highest on Tuesday (109.1 percent of the average).

*Surplus Milk.* The Chicago market carries less surplus milk than formerly. Only the very largest dealers, whose demands for cream were so large that they could not be supplied by jobbers, carried any appreciable amount of surplus. Figures based on approximately one-third of the district show that the percentage of surplus in 1927 was less than half of that carried in 1921.

In Peoria, where surplus milk is purchased at the level of prices paid by manufacturers, the net pool price paid producers becomes higher or lower with decreases and increases in surplus milk. During 1927 the least surplus was produced in January, 23.07 percent; and the largest amount in June, 58.73 percent.

*Dealers' Net Margins.* Data pertaining to the net margins realized upon various retail sales units sold in the Chicago market indicate that milk quarts yielded a profit of .75 of a cent and that milk pints were sold at a loss of 1.56 cents each. In Chicago the ratio of pint to quart retail sales was found to be 1 to 5.62; in St. Louis, 1 to 6.11; and in Peoria 1 to 5.9.

Sweet cream was one of the most profitable milk products handled by Chicago distributors in 1924. When purchased at cream jobber prices, one-half pint of 22-percent cream sold at retail returned the milk distributor a profit of 1.73 cents. The ratio of milk to cream sales, computed on the basis of 3.5-percent milk, was found to be for Chicago, 2.39 to 1; for St. Louis, 3.21 to 1; and for Peoria, 4.22 to 1.

*The Consumer's Dollar.* The average dollar spent by the consumer for wholesale and retail milk in the four markets studied was distributed as follows during the two-year period 1925-1926: cost of product, 46.90 cents; purchasing, receiving, and processing, 14.89 cents; selling and delivery expense, 31.21 cents; general and administrative, 3.58 cents; and net income, 3.42 cents. (Fig. 17, page 244). The distribution of the consumer's dollar in each of the four markets is shown in Table 29, page 242.

*The Consumer's Quart Price.* A large portion of the Chicago milk distribution, at least 95 percent of which was dispensed to the retail trade, was sold during 1925 and 1926 at an average price of 12.91 cents a quart. Of this amount 5.33 cents was paid to the producer; 2.20 cents was for expenses of purchasing, receiving, and processing; 4.60 cents was for selling and delivery expense; .31 cent was for general and administrative expense; and .47 cent was the net income realized by the distributor. (Table 30, page 246).



*Analysis of the Dealers' Expense Dollar.* An analysis of the expense dollar reveals considerable range in the four markets, as shown in Table 31, page 247. The largest part of the expense dollar was used in defraying the expenses of labor salaries and commissions. In Chicago during 1925 to 1926, 65.11 cents of each dollar was used for these expenses. In Peoria where expenses for this purpose were lowest, 43.56 cents of each dollar was required during 1924 to 1926.

Expenses for processing and operating materials and supplies made up the second largest portion of the expense dollar. They ranged from 10.81 cents to 19.04 cents in the four markets. The remainder of the dollar covered depreciation, transportation, repairs, maintenance, and construction, supplies, taxes, insurance, and other expenses, as shown in Table 31, page 247.

*Dealer's Gross Margin.* In the Chicago market the average yearly margin between the price paid producers for their milk and the retail quart price (which difference is often termed the dealer's gross margin) was 8.7 cents in 1925 and 8.5 cents in 1926. In 1927 it averaged 8.6 cents. The increase from the gross margin of twenty years ago (4.7 cents in 1908) is largely the result of increased complexity in milk marketing, of wage increases, expansion of the dairy production district, and improvements in milk quality, as stated above.

*Significant Changes in the Dairy Industry.* The above facts indicate to the investigator that two economic changes of far-reaching consequence to Illinois dairymen are in process; namely, decentralization in production and centralization in distribution. Decentralization in production has been greatly stimulated by recent improvements in milk transportation which render available a milk supply several times larger than the demand of the fluid-milk consumption centers. Dairymen in regions several hundred miles from large fluid-milk markets, where land, wages, and taxes are relatively cheap, are now enabled to compete with long-established dairymen in districts near the large cities, where land prices, labor costs, and taxes are much higher. Some readjustment to this particular situation is already in progress in northern Illinois.

In contrast to production, distribution is gradually becoming more centralized. Economic pressure has forced more efficient methods in milk marketing. Consolidation of distributing agencies has been one way of meeting the pressure for greater efficiency. Since 1923 a significant number of Chicago dealers have either discontinued their business or have merged with others. This movement toward centralization, providing it does not result in the abuses which monopoly makes possible, decreases overhead expenses and places a larger part of milk marketing under the control of more efficient management.



## APPENDIX

TABLE 39.—SEASONAL VARIATION IN PRODUCTION PER DAIRY, CHICAGO DISTRICT, 1912-1926<sup>1</sup>(Average monthly production for period = 100)<sup>2</sup>

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1912.....	99.8	103.9	104.3	109.4	110.2	117.7	101.4	92.2	88.1	88.9	88.9	95.2
1913.....	92.0	96.0	96.0	102.3	117.4	135.3	104.3	92.8	88.1	84.9	90.1	100.8
1914.....	102.7	104.7	107.7	109.3	120.0	121.5	95.5	81.3	81.7	88.5	91.6	95.5
1915.....	99.1	104.1	106.8	111.1	120.3	117.6	101.8	90.3	84.5	86.1	86.1	92.2
1916.....	102.5	107.7	110.4	106.5	120.7	129.0	106.5	81.6	82.0	80.8	82.4	89.9
1917.....	110.2	111.6	112.9	118.2	122.2	132.4	111.6	84.5	70.2	70.2	71.7	81.3
1918.....	103.2	103.7	110.4	112.0	127.0	136.9	99.6	72.1	71.6	74.7	86.1	102.7
1919.....	102.2	109.6	115.3	118.9	122.4	126.8	91.2	77.2	73.2	80.3	85.5	97.4
1920.....	110.3	112.9	114.6	112.9	119.0	126.0	94.2	73.2	75.4	79.3	85.0	97.2
1921.....	98.2	104.1	108.4	114.8	124.2	115.6	91.7	90.5	84.5	89.6	84.9	93.5
1922.....	102.8	107.9	109.6	111.2	125.6	121.4	92.2	87.1	80.4	85.4	85.0	91.4
1923.....	99.2	102.1	106.2	112.0	121.5	119.0	98.7	88.0	87.2	87.2	86.3	92.6
1924.....	91.9	97.4	103.2	107.1	120.0	127.0	107.9	91.9	91.1	90.4	84.1	88.0
1925.....	92.8	96.4	98.2	104.8	121.0	123.6	106.7	97.9	90.6	89.8	86.5	91.7
1926.....	113.1	114.8	108.4	90.1	111.4	121.6	105.0	92.2	90.5	86.3	83.7	82.9

<sup>1</sup>Trend removed. Data are based on receipts at certain milk plants. <sup>2</sup>Quantity upon which percentages are based is approximately 25 percent of Chicago's total milk supply for the fifteen-year period.

TABLE 40.—CLASS PRICES, CHECK-OFFS AND POOL PRICES OF ILLINOIS MILK PRODUCERS ASSOCIATION, PEORIA, FOR 1928  
(Per 100 pounds)

Month	Class 1	Class 2	Class 3	Association check-off	Pool price less check-off
January.....	\$2.70	\$2.04	\$1.94	\$0.06	\$2.41
February.....	2.70	2.00	1.90	.06	2.38
March.....	2.70	2.09	1.98	.06	2.36
April.....	2.70	1.89	1.79	.06	2.26
May.....	2.70	1.82	1.72	.06	2.15
June.....	2.70	1.81	1.70	.05	2.06
July.....	2.70	1.94	1.83	.06	2.19
August.....	2.70	2.06	1.95	.06	2.26
September.....	2.70	2.10	2.00	.06	2.28
October.....	2.70	2.08	1.98	.06	2.35

Note.—Class 1 consisted of all milk sold wholesale and retail in bottles, as fluid milk or cream, and all bulk milk sales. The above price in this class was for 3.5-percent milk with a 5-cent differential operating above and below this percentage.

Class 2 included all milk used in obtaining fluid sweet cream for bulk use, excepting the milk from which cream was derived for butter manufacture or for the manufacture of condensed whole milk and soft cheese containing butterfat. Price in this class was based on butterfat content. Price per pound of butterfat was the price paid for butter extras on the Chicago market plus 3 cents.

Class 3 consisted of all milk from which cream was derived for butter manufacture and frozen cream storage. Price was determined on butterfat content same as for Class 2 except that the additional 3 cents was excluded. An allowance ranging from 20 cents to 30 cents per 100 pounds was made for all skim milk resulting from cream separation.

TABLE 41.—SEASONAL VARIATION IN SALES<sup>1</sup> OF RETAIL AND WHOLESALE MILK DURING TWO-YEAR PERIOD<sup>2</sup>  
(Average monthly sales of each district = 100)

	City	Jan.	Feb.	March	April	May	June	July	August	Sept.	October	Nov.	Dec.
<b>Pasteurized milk</b>													
Gallons	Chicago	97.9	98.7	99.3	100.4	100.9	104.0	100.9	98.8	100.2	103.6	100.2	95.1
	St. Louis	87.7	98.2	97.5	113.0	111.9	103.6	93.0	90.3	103.3	103.3	105.8	97.5
	Peoria	116.6	113.4	108.1	94.4	93.3	89.1	86.9	97.5	81.6	98.6	106.0	114.5
	Quincy	126.9	110.8	110.1	205.6	85.2	76.3	78.7	69.1	83.5	82.7	84.3	86.8
Quarts	Chicago	99.3	100.1	101.0	100.9	99.8	100.3	95.9	95.6	102.1	102.0	101.9	101.1
	St. Louis	102.3	103.3	104.6	103.3	101.6	102.6	97.6	95.6	98.5	96.5	96.2	97.9
	Peoria	100.7	101.4	103.1	100.5	99.5	98.5	98.0	93.5	98.4	100.3	102.1	104.0
	Quincy	96.2	100.9	101.3	99.4	99.8	99.3	97.5	95.5	102.9	99.1	101.7	106.4
Pints	Chicago	89.5	92.4	94.4	98.0	98.0	106.8	106.1	109.0	110.5	104.5	97.7	93.1
	St. Louis	78.1	83.1	87.2	96.7	100.5	108.2	110.4	112.5	114.1	112.3	107.8	89.1
	Peoria	86.8	84.5	90.4	90.6	92.3	97.1	99.2	100.1	101.4	127.2	118.7	111.7
	Quincy	91.1	89.5	89.4	91.1	99.5	103.3	105.5	104.8	110.6	110.9	103.4	100.9
Half-pints	Chicago	100.4	106.8	113.8	103.3	106.9	105.2	68.8	68.2	108.7	119.3	106.2	92.4
	St. Louis	112.2	126.1	124.2	127.4	102.2	76.1	66.9	66.8	85.8	110.1	110.7	91.5
	Peoria	109.7	127.9	131.0	102.3	89.7	53.9	44.6	46.0	58.6	110.3	193.4	132.6
	Quincy	86.4	110.9	106.5	118.9	106.2	93.5	89.1	85.8	102.8	91.8	97.5	110.6
<b>Certified milk</b>													
Quarts	Chicago	102.6	104.9	105.9	106.9	106.2	102.6	93.2	91.4	97.0	96.8	95.1	96.4
	St. Louis	97.9	98.3	100.4	102.1	103.7	101.7	96.9	96.8	103.9	102.7	98.9	96.7
Pints	Chicago	102.3	107.1	110.7	113.5	108.4	103.4	92.9	90.0	93.8	93.0	91.7	93.2
	St. Louis	93.7	98.2	101.4	104.3	106.2	101.4	97.2	97.9	100.9	100.9	100.3	97.6

<sup>1</sup>Based upon more than 50 percent of the distribution in each city. Trend removed. <sup>2</sup>Chicago, 1925-1926; St. Louis, 1924-1925; Peoria, October, 1926—October, 1927; Quincy, 1925-1926.

TABLE 42.—SEASONAL VARIATION IN SALES<sup>1</sup> OF RETAIL AND WHOLESALE CREAM DURING TWO-YEAR PERIOD<sup>2</sup>  
(Average monthly sales of each district = 100)

	City	Jan.	Feb.	March	April	May	June	July	August	Sept.	October	Nov.	Dec.
22-percent cream													
Pints.....	St. Louis.....	108.4	105.2	106.5	107.7	112.3	101.5	77.6	71.1	87.7	99.3	109.0	113.7
	Peoria.....	98.9	96.5	106.2	100.5	102.9	105.4	94.9	87.7	96.5	103.8	102.9	103.8
Half-pints.....	Chicago.....	104.2	101.9	102.3	103.3	103.3	97.4	92.2	91.5	97.8	100.4	102.5	103.2
	St. Louis.....	104.3	105.1	106.4	105.0	109.3	100.5	87.9	84.1	92.2	98.1	102.8	104.3
	Peoria.....	96.1	91.1	98.5	100.5	104.0	99.4	99.9	98.5	98.4	105.9	102.8	104.9
	Quincy.....	102.4	103.8	108.7	109.5	102.0	100.9	90.0	90.8	95.3	96.7	99.4	100.5
32-percent cream													
Pints.....	St. Louis.....	159.0	137.2	128.9	113.8	123.0	68.6	44.3	24.3	33.5	74.5	131.4	161.5
	Peoria.....	112.6	104.0	95.3	112.6	104.0	91.0	60.6	65.0	69.3	99.6	130.0	156.0
	Quincy.....	125.0	125.0	112.5	112.5	112.5	87.5	50.0	50.0	50.0	87.5	137.5	150.0
Half-pints.....	Chicago.....	119.2	116.8	114.9	122.1	130.1	89.2	65.7	63.7	68.8	88.4	110.1	111.0
	St. Louis.....	134.1	133.0	139.7	120.2	128.7	71.3	62.7	40.4	34.2	79.1	128.4	133.2
	Peoria.....	125.5	121.1	115.8	107.8	106.0	84.8	67.7	58.3	61.0	107.8	139.6	109.6
	Quincy.....	129.0	136.8	148.5	125.1	117.3	86.0	54.7	40.9	54.7	62.5	117.3	121.2

<sup>1</sup>Based on more than 50 percent of the distribution in each city. Trend removed. <sup>2</sup>Chicago, 1925-1926; St. Louis, 1924-1925; Peoria, October, 1926—October 1927; Quincy, 1925-1926.

TABLE 43.—SEASONAL VARIATION IN SALES OF RETAIL AND WHOLESALE MISCELLANEOUS PRODUCTS<sup>1</sup> FOR TWO-YEAR PERIOD<sup>2</sup>  
(Average monthly sales of each district = 100)

	City	Jan.	Feb.	March	April	May	June	July	August	Sept.	October	Nov.	Dec.
<b>Cultured milk</b>													
Gallons.....	Chicago.....	65.1	74.2	71.7	84.7	86.0	136.8	168.1	166.8	123.8	91.2	71.7	59.9
	St. Louis.....	52.6	92.0	127.0	144.4	148.9	127.0	96.4	83.2	70.1	105.1	70.1	83.2
Quarts.....	Chicago.....	70.3	76.2	80.7	90.9	101.4	133.2	148.7	138.4	118.7	88.7	79.2	73.6
	St. Louis.....	95.3	98.8	103.9	107.6	106.8	116.8	111.8	103.6	97.4	89.1	86.6	82.3
Pints.....	Chicago.....	79.9	64.0	61.4	74.9	101.8	143.9	148.1	139.7	131.3	97.6	85.0	72.4
	St. Louis.....	93.1	109.0	106.5	102.3	100.6	124.1	128.3	116.6	108.2	89.7	55.3	66.3
Half-pints.....	Chicago.....	58.6	63.3	68.4	87.7	110.3	163.5	165.4	145.4	123.1	81.5	69.4	63.4
	St. Louis.....	61.9	88.0	76.9	113.2	147.1	124.3	111.7	108.8	112.2	97.7	79.8	78.4
<b>Butter</b>													
Pounds.....	Chicago.....	82.4	98.0	111.9	119.7	114.4	106.3	97.3	95.8	106.5	104.2	83.7	79.8
	St. Louis.....	103.1	104.3	110.3	103.9	101.5	92.3	86.9	90.0	98.8	103.0	104.8	101.1
<b>Cottage cheese</b>													
Pounds.....	Chicago.....	82.9	94.5	95.4	97.2	85.6	83.8	77.6	77.6	91.8	98.0	140.0	175.6
	St. Louis.....	99.4	125.7	146.8	134.0	105.7	99.9	86.2	78.1	73.2	81.4	88.9	80.7
12-ounce packages.	Chicago.....	86.3	97.4	116.4	103.5	87.9	80.5	76.0	93.7	90.1	142.0	121.7	104.5
	St. Louis.....	107.0	118.3	141.5	125.0	108.1	101.6	89.4	70.9	85.4	81.9	87.6	83.3

<sup>1</sup>Based on more than 50 percent of the distribution in each city. Trend removed. <sup>2</sup>Chicago, 1925-1926; St. Louis, 1924-1925.



TABLE 44.—SHRINKAGE OCCURRING DURING PROCESS OF DISTRIBUTION,  
CHICAGO DISTRICT, 1925-1926  
(Based on an average monthly distribution of about 17 million pounds)

Month	Percentage of waste of total milk purchased
January.....	.65
February.....	.73
March.....	.44
April.....	1.10
May.....	1.08
June.....	1.07
July.....	.86
August.....	.85
September.....	1.02
October.....	.89
November.....	.94
December.....	.78

TABLE 45.—ALLOCATION OF RETAIL SALES POINTS IN CHICAGO AND ST. LOUIS  
DISTRICTS, JANUARY 1, 1928

	Chicago	St. Louis
	<i>points</i>	<i>points</i>
Certified milk		
Quarts.....	1	2
Pints.....	1	1
Regular and cultured milk		
Quarts.....	1	1
Pints.....	1	½
Thirds.....	½	3/10
Half-pints.....	½	¼
Cream		
Quarts.....	4	4
Pints.....	2	2
Half-pints.....	1	1
Quarter-pints.....		½
Cocoa drinks		
Quarts.....	1	....
Pints.....	1	....
Half-pints.....	½	....
	(Commissions)	
Cottage cheese		
10- to 16-ounce containers.....	\$ .01	1
Butter		
Pounds.....	.01	1
Eggs		
Dozens.....	.01	....

TABLE 46.—BOTTLE AND OTHER MILK-CONTAINER LOSSES IN CHICAGO DISTRICT, 1926

	Number of deliveries <sup>1</sup>	Number of replacements required	Average trips per container
<b>Bottles</b>			
Quarts.....	61,165,832	2,407,639	25.4
Pints.....	22,206,562	1,860,660	11.9
Third-quarts.....	36,841	2,129	17.3
Half-pints.....	21,106,184	925,586	22.8
Quarter-pints.....	466,830	34,956	13.4
Cheese jars.....	26,500	8,000	3.3
10-gallon cans.....	199,002	980	203.1
Cases.....	6,190,475	29,344	211.0

<sup>1</sup>Based on number of times bottles were filled.TABLE 47.—DEALERS' MARGINS IN CHICAGO DAIRY DISTRICT, 1908-1927  
(Figures indicate cents per quart and are the difference between price paid producers at country stations and retail price per quart)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
1908.....	4.7	3.7	3.7	4.1	4.7	5.0	4.7	4.3	4.1	3.9	3.7	3.7	4.2
1909.....	3.7	3.7	3.9	4.0	4.6	5.0	4.7	4.3	4.1	3.7	4.3	4.2	4.2
1910.....	4.2	4.3	4.7	4.9	5.4	5.7	5.4	5.2	5.0	4.3	3.9	3.7	4.7
1911.....	3.7	3.9	4.3	5.2	5.6	5.9	5.2	4.9	4.9	4.3	4.0	3.9	4.7
1912.....	4.0	4.1	4.5	5.2	5.7	5.9	5.2	4.9	4.8	4.6	4.2	4.1	4.8
1913.....	4.2	4.3	4.6	4.8	5.3	5.5	5.1	4.8	4.7	4.2	4.0	3.9	4.6
1914.....	3.9	4.2	4.5	4.8	5.3	5.6	5.1	4.7	4.7	4.1	3.9	3.9	4.6
1915.....	4.0	4.2	4.5	4.9	5.4	5.6	5.2	4.7	4.7	4.1	3.9	3.9	4.6
1916.....	4.0	4.2	4.5	4.5	4.9	5.3	4.7	5.3	5.3	4.9	4.5	4.5	4.7
1917.....	4.6	4.7	5.0	4.8	5.7	6.6	5.4	5.1	5.1	5.6	5.1	5.1	5.2
1918.....	5.1	5.4	5.8	6.3	7.6	8.1	7.1	6.6	6.7	5.9	6.1	5.9	6.4
1919.....	5.9	6.5	6.6	7.0	8.6	8.6	7.6	7.4	7.4	7.2	7.3	7.2	7.3
1920.....	7.3	7.8	7.8	8.1	8.2	8.1	8.1	8.0	8.0	8.0	8.4	8.4	8.0
1921.....	8.6	8.9	8.9	8.9	9.6	9.6	9.1	9.1	8.8	8.2	8.1	8.1	8.8
1922.....	8.1	8.3	8.3	8.3	8.3	8.6	7.7	7.6	7.7	7.6	7.6	7.5	8.0
1923.....	7.6	7.6	7.8	7.8	8.1	8.2	8.1	8.1	8.1	8.1	8.1	8.1	8.0
1924.....	8.2	8.2	8.2	8.6	9.1	9.1	8.6	8.4	8.4	8.8	8.8	8.8	8.6
1925.....	8.8	8.8	8.8	8.8	8.9	8.9	8.6	8.5	8.5	8.5	8.5	8.6	8.7
1926.....	8.6	8.6	8.6	8.1	8.6	8.8	8.6	8.4	8.4	8.5	8.6	8.6	8.5
1927.....	8.6	8.6	8.6	8.6	8.8	8.8	8.5	8.6	8.6	8.6	8.6	8.6	8.6

TABLE 49.—AVERAGE PRICES PAID PRODUCERS SUPPLYING FLUID-MILK DEALERS IN CHICAGO<sup>1</sup> AND ST. LOUIS MARKETS, 1923-1927  
(Per 100 pounds of 3.5-percent milk f.o.b. country receiving stations)

Month	1923		1924		1925		1926		1927	
	Chicago	St. Louis	Chicago	St. Louis	Chicago	St. Louis	Chicago	St. Louis	Chicago	St. Louis
January.....	\$2.50	\$2.25	\$2.675	\$2.45	\$2.40	\$2.30	\$2.50	\$2.20	\$2.50	\$2.35
February.....	2.50	2.30	2.675	2.45	2.40	2.30	2.50	2.20	2.50	2.30
March.....	2.40	2.25	2.675	2.25	2.40	2.00	2.50	2.15	2.50	2.25
April.....	2.40	2.15	2.50	1.95	2.40	2.00	2.75	2.00	2.50	2.00
May.....	2.30	1.85	2.30	1.60	2.35	1.75	2.50	1.60	2.40	1.70
June.....	2.25	1.85	2.30	1.60	2.35	1.75	2.40	1.70	2.40	1.70
July.....	2.75	2.00	2.50	1.80	2.50	1.95	2.50	1.80	2.55	1.90
August.....	2.75	2.10	2.60	1.80	2.55	1.95	2.60	2.00	2.50	1.90
September.....	2.75	2.10	2.60	1.85	2.55	2.05	2.60	2.00	2.50	2.00
October.....	2.75	2.25	2.40	2.00	2.55	2.10	2.55	2.05	2.50	2.10
November.....	2.75	2.40	2.40	2.00	2.55	2.20	2.50	2.20	2.50	2.30
December.....	2.75	2.40	2.40	2.20	2.50	2.20	2.50	2.25	2.50	2.35

<sup>1</sup>See Bulletin 269 of this Station, by H. A. Ross, for Chicago prices previous to 1923.

TABLE 48.—RATIO OF JOBBERS' PRICES OF 36-PERCENT CREAM TO COST OF CREAM  
WHEN PURCHASED AS 3.5-PERCENT MILK IN CHICAGO DAIRY DISTRICT  
(Cost of cream when purchased as fluid milk at current monthly  
station price = 100)

Month	1918	1919	1920	1921	1922	1923	1924	1925	1926
January.....	75.0	63.7	81.8	96.7	99.4	96.7	85.2	87.8	92.5
February.....	75.3	88.3	86.4	94.0	104.8	92.5	82.5	87.8	92.5
March.....	76.2	87.5	94.4	94.0	111.0	96.6	82.5	92.2	92.5
April.....	83.3	64.7	91.9	96.0	111.0	96.6	84.1	92.2	84.3
May.....	108.0	100.9	101.3	102.9	104.8	100.5	91.4	94.0	88.3
June.....	140.3	100.9	99.6	97.7	118.2	102.6	87.8	94.0	87.8
July.....	114.2	98.1	96.7	91.4	105.3	88.1	80.8	88.3	84.1
August.....	99.6	91.0	83.6	91.4	102.9	88.1	78.5	90.8	80.7
September....	100.8	84.2	82.3	133.6	105.3	81.7	76.7	86.7	86.5
October.....	91.9	81.0	73.8	108.0	108.0	81.7	79.0	90.8	90.8
November....	85.1	83.1	89.7	105.2	113.1	81.7	83.4	90.8	92.5
December....	86.4	83.7	96.9	105.2	117.5	83.0	96.6	92.5	96.7

TABLE 50.—AVERAGE PRICES PAID PRODUCERS SUPPLYING FLUID-MILK DEALERS  
IN PEORIA AND QUINCY DISTRICTS, 1924-1927  
(Per 100 pounds of 3.5-percent milk f.o.b. city plant)

Month	1924		1925		1926		1927	
	Peoria	Quincy	Peoria	Quincy	Peoria	Quincy	Peoria	Quincy
January.....	\$2.40	\$2.60	\$2.25	\$2.60	\$2.30	\$2.60	\$2.46	\$2.70
February.....	2.40	2.60	2.25	2.60	2.20	2.60	2.45	2.60
March.....	2.40	2.60	2.15	2.60	2.20	2.60	2.44	2.60
April.....	2.25	2.50	2.15	2.50	2.10	2.50	2.34	2.50
May.....	2.00	2.50	2.00	2.50	2.00	2.50	2.02	2.50
June.....	1.80	2.50	2.00	2.50	2.00	2.50	2.04	2.50
July.....	1.80	2.50	2.00	2.50	2.00	2.50	2.10	2.50
August.....	1.80	2.50	2.25	2.50	2.00	2.50	2.15	2.50
September....	1.80	2.50	2.10	2.60	2.00	2.50	2.31	2.70
October.....	1.80	2.60	2.10	2.60	2.23	2.50	2.34	2.70
November....	1.90	2.60	2.20	2.60	2.31	2.70	2.38	2.70
December....	2.25	2.60	2.30	2.60	2.35	2.70	2.41	2.70

TABLE 51.—AVERAGE PRICES PAID PRODUCERS SUPPLYING CONDENSARIES  
IN EASTERN SECTION OF NORTHERN-CENTRAL STATES<sup>1</sup>  
(Per 100 pounds of 3.5-percent milk f.o.b. condensary)  
(Case and bulk goods)

Month	1920	1921	1922	1923	1924	1925	1926	1927
January.....	\$3.57	\$2.04	\$1.65	\$2.43	\$2.16	\$1.93	\$2.15	\$2.28
February.....	3.35	1.98	1.50	2.40	2.12	1.92	2.06	2.29
March.....	3.02	2.05	1.46	2.34	2.08	1.94	2.00	2.21
April.....	2.86	2.16	1.46	2.26	1.89	1.94	1.94	2.15
May.....	2.81	1.94	1.43	2.04	1.68	1.90	1.80	2.00
June.....	2.69	1.55	1.42	2.01	1.60	1.84	1.79	1.91
July.....	2.98	1.57	1.58	2.11	1.61	1.91	1.77	1.91
August.....	3.21	1.85	1.70	2.15	1.63	1.98	1.82	2.01
September.....	3.14	1.84	1.74	2.16	1.62	2.01	1.93	2.08
October.....	2.70	1.84	1.84	2.18	1.64	2.08	1.98	2.16
November.....	2.43	1.85	2.09	2.18	1.66	2.12	2.08	2.21
December.....	2.24	1.81	2.35	2.19	1.85	2.14	2.21	2.27

<sup>1</sup>Prices were obtained from market reports issued by the Bureau of Agricultural Economics, U. S. Department of Agriculture.

TABLE 52.—AVERAGE MONTHLY WHOLESALE BUTTER PRICES PAID FOR EXTRAS  
IN THE CHICAGO MARKET,<sup>1</sup> 1918-1927  
(Cents per pound)

Month	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	Ten-year average
January.....	49	60	63	48	34	50	52	39	43	48	48.6
February.....	49	49	63	47	37	50	49	40	43	50	47.7
March.....	41	60	66	47	38	49	46	48	42	49	48.6
April.....	42	62	64	44	37	45	37	43	38	48	46.0
May.....	42	57	57	29	34	40	37	41	39	41	41.7
June.....	42	51	55	32	36	39	39	42	39	40	41.5
July.....	43	51	55	39	34	38	38	42	39	40	41.9
August.....	45	53	54	40	33	43	37	42	40	41	42.8
September.....	55	57	57	42	39	46	37	46	43	45	46.7
October.....	56	64	57	45	44	47	37	49	46	46	49.1
November.....	62	69	60	44	50	52	42	50	49	48	52.6
December.....	67	68	51	43	53	53	42	47	53	51	52.8

<sup>1</sup>Prices obtained from 1927 Yearbook, U. S. Department of Agriculture, with the exception of January and February, 1918.









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